MONITORING MIGRATION IN THE PRAIRIE PROVINCES

ADMINISTRATIVE DATA SOURCES AND METHODOLOGIES

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ROBERT STOCK

CANADIAN PLAINS REPORTS ■ 5
BARBARA JONES, COORDINATOR OF PUBLICATIONS

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PREFACE

This report has been produced as a first product of the Canadian Plains Migration Study. The project dates back to 1976 when the Research Board of the Canadian Plains Research Center, University of Regina, identified Plains demography as an area worthy of future research. The proposal project evolved from a general focus on spatial demography of the Plains, to migration patterns, and finally on methodologies for deriving current migration estimates from government administrative files. This topic was selected as one of considerable practical interest to Prairie governments, which require accurate estimates of current migration levels for planning purposes. Migration is occurring at a rapid rate in the Prairie region, and is bringing significant demographic and economic effects to regions of net in-migration and net out-migration alike.

The Canadian Plains Migration Study was directed by an Advisory Group composed of representatives from each of the three Prairie provincial governments, with the Director of the Canadian Plains Research Center acting as chairman. The author of the report was appointed as Research Coordinator for six months, commencing in October, 1980.

The majority of the research has been conducted in Edmonton, due to the concentration of relevant resources there, plus the provision of funding for the project by the government of Alberta. The governments of Manitoba and Saskatchewan also cooperated in the study. In the course of the project, visits were made to Regina, Winnipeg, Ottawa and Toronto to obtain information on provincial and federal work on migration methodologies.

The organization of this report reflects the research objectives identified for the project by the Advisory Group and the Research Coordinator. The introductory section briefly describes methodologies which are used to derive migration estimates. Methodologies other than the use of administrative data for migration monitoring purposes have not been investigated in the current project.

The following section provides an evaluation of several administrative files as potential data sources for migration studies. The maintenance of the file, population covered, geographical coding, and strengths and weaknesses for obtaining migration data are among the topics considered. The provincial health care files, family allowance

accounts and income tax filer data are identified as having the greatest potential.

The methodologies presently used to derive international, inter-provincial and intra-provincial migration estimates, together with other methodologies in the developmental stages, are described in the following section.

The final part of the report suggests a methodology for producing current migration estimates for sub-provincial areas. The method combines data from family allowance accounts on the migration of children with multipliers obtained from health care data to produce estimates of total migration. In the absence of any single file likely to provide complete, unbiased and up-to-date estimates, this method appears to have the potential to combine the strengths of two of the better data sources, while minimizing the impact of their weaknesses. Moreover, the approach seems politically feasible, in that major systems changes or programmes to "clean up" sources of error in the files would not be required.

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I wish to acknowledge with gratitude the assistance of numerous people whose help has made this study possible.

The Migration Study Advisory Group established guidelines for the project and provided valuable local support and feedback as it progressed. The Advisory Group is chaired by Dr. M. Evelyn Jonescu, Director of Canadian Plains Research Center, and has as members Dr. Bill Wong from Alberta, Ms. Denise Kouri from Saskatchewan and Ms. Betsy Gibbons from Manitoba.

Thanks to the assistance and support of Dr. Jonescu and Ms. Lorraine Nelson, administrative difficulties associated with being based outside Regina were rendered insignificant.

Dr. Bill Wong of the Planning Secretariat, Alberta Advanced Education and Manpower, was most helpful in providing his own time, access to information sources and material support for the project. The assistance of others in the Planning Secretariat, especially Dr. David Sunahara and Mr. Bill Smith, is gratefully acknowledged.

Ms. Denise Kouri, Saskatchewan Bureau of Statistics, acted as a liaison person in Saskatchewan, and provided valuable information on migration-related data sources and methodologies used in the province. Ms. Betsy Gibbons, Manitoba Labour and Manpower, was equally helpful in providing information and guidance with regard to Manitoba.

During the course of the project, it was necessary to make contact with dozens of people in search of information on administrative files and migration methodologies. Reaction to these requests for information was not uniformly positive. However, any uncooperative responses only served to increase my gratitude to the many people who were extremely open and helpful in responding to my requests for often obscure information.

Funding for the Canadian Plains Migration Study was supplied by Alberta Advanced Education and Manpower.

The Boreal Institute for Northern Studies, University of Alberta, generously provided office space and support for the Research Coordinator.

I would also like to thank Ms. Anita Moore for typing this report.

Finally, I would like to stress that the interpretations contained in the report are those of the author and do not necessarily represent the opinions of the government agencies contacted or of the Canadian Plains Research Center.

1. INTRODUCTION: OBTAINING MIGRATION ESTIMATES

Governments are interested in population change because of its significance for planning. Population changes as a result of natural increase or decrease, i.e., births and deaths. These components of population change are readily monitored. The other component of change, namely net migration, can generally not be directly measured.

The impact of migration on population change is very significant and growing. Birth rates have fallen considerably since the 1950s and early 1960s. Significant change in the economic fortunes of the various Canadian regions during the past decade has provided a major incentive for people to move, moreover to change their patterns of mobility. For example, Saskatchewan, traditionally a net loser of migrants to other provinces, has experienced growth due to migration in recent years. Ontario, which has traditionally gained population from other provinces has started to experience a net outflow of migrants. Since 1966, Alberta has changed from a province experiencing a net loss of migrants to other provinces, to one with a balance of in-migration and out-migration streams, to one with modest growth, and finally the present situation in which Alberta is rapidly growing due to migration as a result of its considerable rate of economic growth. Alberta gained an estimated 43,000 people in 1979 due to net migration, compared to an estimated 24,000 through natural increase in the same year. The actual impact of migration is much greater than is initially apparent. Firstly, the majority of migrants are of working age, and so directly affect the size and composition of the labour force at the places of both origin and destination. Secondly, by fostering economic growth in the areas of destination, migration acts as an "engine of growth" stimulating further migration. The converse applies in these provinces experiencing significant net out-migration. Migration is equally important in causing differential growth within provinces. Large cities and regions with expanding resource industries attract migrants more readily than rural agricultural areas and areas of economic stagnation. Since the propensity to migrate varies with age, the age structure of both source and destination areas is affected. Migrating young adults carry their fertility with them, thus affecting crude birth rates positively in their new province of residence, and negatively in their former province of residence.

Because of the importance of migration in both demographic and

economic terms, government agencies as well as those in the private sector who hope to profit from population turnover have a strong interest in knowing about present and future migration trends. Governments need such data to determine the location and size of probable future demand for such services as education, health care and social welfare. Economic planning cannot be effective without an understanding of the role of migration in satisfying the demand for particular types of labour in areas of economic growth. Grants to municipalities depend on population size; consequently, municipal governments have a vested interest in the complete enumeration of in-migrants, while provincial governments have reason to avoid over-counts by knowing the extent of out-migration. The private sector benefits from migration both directly (e.g., moving companies and real estate companies) and indirectly (e.g., the commercial and service sectors and the construction industry). In areas of net out-migration, the private sector may profit indirectly from access to accurate migration data by transferring investment to some other locality where more rapid population growth is projected.

Demographers use a variety of models and procedures to estimate the volume of migration, whether past, present or future. The methodologies may be divided into three general categories, namely the residual method, forecasting models and migrant enumeration.

Each of these approaches is briefly discussed in this chapter. However, most of these methods are of only peripheral relevance in this study. For example, econometric models seeking to forecast present or future migration levels are beyond its scope. Rather, the focus is on administrative data and its use in *monitoring* migration.

(a) Residual Method

The basic demographic equation for population change between two points in time may be expressed as follows:

Population change = (Births-deaths) + (in-migration - out-migration).

Of the elements in the equation, only those concerning migration cannot readily be obtained. Population change may be derived by comparing census populations for the temporal reference points. Vital registers provide relatively accurate data on natural increase, i.e., births and deaths. With the above data, the remaining unaccounted population change (the residual) may be attributed to net migration.

Statistics Canada employs the residual method to estimate migration for census divisions. Both census data and inter-censal population estimates are used as base populations. Data derived from municipal censuses may also be used to obtain estimates of the total population, keeping in mind the limitations of municipal censuses.

The utility of the method depends on the accuracy of the data used to determine total populations at the beginning and end of the period. Consequently, the residual term actually includes not only net migration but also the net error in the baseline populations. However, the term is usually assumed to represent net migration, and net error is assumed to be zero.

A second weakness of the residual method lies in its inability to provide estimates of in-migration or out-migration, much less of the geographical pattern of migratory movement. Rather, a single figure is obtained for each spatial unit, i.e., the residual, which is assumed to equal net migration.

A final short-coming is the fact that migration is not measured independently. Consequently, no real understanding of the nature and extent of migratory movements can be derived from these data.

(b) Forecasting Models

The objective of forecasting models is the capability to estimate migration levels, particularly in the future. The simplest type of forecasting is projection, which in effect says that present and near-future migration levels are a function of past migration levels. These models have partial theoretical validity, since much migratory movement is of the "chain migration" variety. An initial migration episode is commonly followed by other migrations which have resulted because of the sponsorship of a previous migrant, or due to positive information sent by migrants to their areas of origin.

The majority of forecasting models use statistical techniques in which migration levels are expressed as being a function of various economic and/or non-economic variables. These variables are put into equation form and are commonly calibrated using multiple regression techniques or are derived through the solution of simultaneous equations. The main types of forecasting are gravity, push-pull, probability and behavioural models.

Aggregate forecasting models are essentially deterministic. In other words, the model states that, given a certain set of conditions, a certain level of migration may be expected. Models which deal with the migration behaviour of sets of individuals within given migration streams tend to be probabilistic. In other words, given certain characteristics pertaining to the places of origin and destination and to the potential migrant, these models estimate the *probabilities* of various migratory events.

(i) Projection

Short-term migration estimates are sometimes made by projecting migration trends from the recent past into the near future. If

quarterly estimates are required, seasonal adjustment factors must be applied to the projections.

Any projection is only as good as the data and assumptions upon which it is based. The further a projection is extended into the future, the poorer its reliability. Whereas births, deaths and total population can be projected quite successfully, migration estimates derived by projection are generally very tenuous. Migration levels change rapidly and radically in response to changing economic conditions, the circulation of information, government policies, and "fashion."

British Columbia's Central Statistics Bureau uses a projection model known as "crisis." The model estimates quarterly migration on the basis of migration in the previous quarter, intercept and slope parameters derived using regression, and dummy variables reflecting seasonal fluctuations. The model is not designed to provide sophisticated or long-term estimates of migration. Rather, it is used to generate estimates quickly for up to four quarters.

McRae's study, entitled "British Columbia Subprovincial Migration Modelling for the Central Statistics Bureau", showed that the number of migrants from the previous time period was the best indicator of intra-provincial migration in British Columbia. Inter-provincial migration was more successfully estimated using various economic variables.

(ii) Gravity Models

Gravity models express in equation form the nineteenth century observations of Ravenstein concerning the relationship between migration and both distance and population size. Migration levels are said to vary inversely with the distance between two points and directly with the populations of the two points. Gravity models were popular during the 1940s and 1950s, but have now been replaced by more realistic models. However, distance and population size are still recognized as being very important determinants of migration, and are commonly incorporated into geographical models of migration.

(iii) Probability Modelling

Migration levels may be forecast on the basis of probability modelling. A transformation matrix is derived showing the probabilities of migrating between each pair of the various sub-areas being considered. In the more complex models, separate transformation matrices are derived for major socio-demographic categories (e.g., age and sex, occupation, education, etc.).

The transformation matrices may be derived empirically from past migration data, or theoretically using simultaneous equations expressing the relationship between migration volume and the main determinants of migration.

Probability models which do not subdivide the population into meaningful cohorts are overly simplistic. However, the more specific the model, the more complex and difficult to calibrate it becomes. Moreover, use of a probability approach implies acceptance of the rather unrealistic assumption of comparative stability over time in migration patterns.

(iv) Push-pull Models

Push-pull models start with the assumption that migration can be understood as a response to "push" factors at places of origin which predispose certain cohorts to migration, and "pull" factors at places of destination which attract migrants. These push and pull factors may be expressed in the form of an econometric model incorporating economic variables such as distance, information and quality of life. Migration levels form the dependent variable in the equation, while the other variables are independent. Multiple regression techniques are commonly used to calibrate the model. The independent variables are often expressed as a difference or ratio between the places of origin and destination in order to focus on the significance of *disparities* in generating migration.

A considerable amount of work is being conducted in British Columbia's Central Statistics Bureau on econometric modelling of migration. D. McRae's thesis on migration modelling for British Columbia represented a first attempt to model the province's migration system. This model has subsequently been modified to improve its forecasting ability. The independent variables used are the ratio of B.C. to Canadian unemployment rates, capital expenditures in B.C. as a percentage of the national total, and seasonal dummy variables.

The ultimate test of any forecasting model lies in its tracking ability, namely its ability to closely replicate known levels of migration (actual) occurring in the recent past, and consequently to provide future estimates which can be accepted with considerable confidence. McRae's current model has been found to have extremely good tracking ability for quarterly inter-provincial migration to British Columbia in the 1968-80 period. The mean error level was found to be 7.91% per quarter for in-migration, 6.59% per period for out-migration and 25.5% for quarterly net migration. The tracking ability for annual migration volumes was significantly better, i.e., 3.78%, 3.01% and 15.3% for in-, out- and net migration.

Alberta is currently developing a detailed econometric model of the Alberta economy, one sector of which pertains to demographic change in the province. Migration to the province is forecast using a push-pull type model. The dependent variable is net inter-provincial migration to Alberta, while the independent variables are measures of real expected market income, per capita government expenditure on

non-market goods and services, per capita income taxes paid by individuals, growth in employment, annual growth of gross national product, and money, psychic and opportunity costs based primarily on the distance travelled.

Developing or even modifying an econometric model so that it produces estimates of acceptable accuracy for a given study area is generally a long and tedious process. There is no guarantee that the model which seems to work now will still produce acceptable estimates in the future. Nevertheless, a successful model can be extremely valuable as a predictive tool, forecasting changes in migration flows which might otherwise not be expected.

(v) Behavioural Models

Increasing attention has been focused in recent years on non-economic factors as determinants of migration. The popularity of destinations such as Colorado or Vancouver has depended more on "image" than on economic factors. Images of places are personal; no two people have exactly the same mental sets of information and priorities.

The behavioural approach seeks to examine the mental constructs which underlie migration behaviour. Using the language and techniques of behavioural psychology, the cognitive and perceptual context of migration is investigated. This involves sample survey research in which individuals are questioned about their spatial knowledge ("mental maps," "action space"), and their assessment of potential destinations based on their own sets of priorities ("place utilities," "spatial perception"). The various determinants are combined and weighted using multivariate statistical techniques such as factor analysis or discriminant analysis. The article by Wolpert (1965) provides a good introduction to the behavioural approach in migration studies.

The primary limitation of the behavioural approach is the need for sample survey data. Spatial cognition and perception are constantly changing due to a wide range of unpredictable events and trends, with the result that specific behavioural models quickly become obsolete.

(c) Monitoring Migration

Monitoring is used to refer to techniques for estimating migration in which contemporary data sources are employed in an attempt to count migrants. This count may be of the total migrant population or of a specific cohort. If the entire migrating population cannot be enumerated, it may be possible to develop multipliers or adjustment factors to obtain estimates of total migratory flows from partial data referring to a definable sub-population.

(i) Migration registers

In certain countries, for example Sweden, persons who migrate are under legal obligation to report their change of address. These registers contain a virtually complete spatial, temporal and socio-demographic record of migration behaviour and represent the ideal data source for migration study purposes. However, such a system is unlikely to be instituted in Canada in the foreseeable future, due to its inevitable political unpopularity.

(ii) Census data

Censuses commonly include questions designed to provide information on mobility. For example, the 1971 Census of Canada included a question on respondent's place of residence five years earlier. Such questions provide a valuable source of data on net migratory flows within a specified time period. However, moves completed in the interim cannot be detected. Neither can gross in-migration or out-migration levels be ascertained.

Published data from the census are likely to refer only to larger spatial units. For example, an inter-provincial migration matrix is likely to be produced, and net population change due to migration may be reported for census divisions and larger municipalities. It may be possible to retrieve migration data for smaller areal units from the original tapes.

A major short-coming of this data source is its infrequency, namely every five years. This means that the data are only good for retrospective analysis, and for verification of trends detected by other monitoring techniques.

(iii) Sample surveys

Government agencies and researchers often use sample surveys to determine the number and characteristics of migrants. In such surveys, a sample of the target population is scientifically selected to minimize systematic biases. A questionnaire is administered to each member of the sample.

The main advantage of a sample survey is its flexibility with regard to the number and type of questions asked. Since the survey deals specifically with migration, it should be possible to obtain more reliable data than could be obtained from sources designed to meet some other need. The major disadvantage is that such surveys may be comparatively expensive; costs associated with questionnaire design and testing, printing, and interviewer time and/or postage and coding may be considerable. These costs are all additional to the data analysis costs which represent the only significant recurring cost for data obtained from administrative files.

Alberta and British Columbia are currently cooperating with Statistics Canada in an experimental migration survey. Statistics Canada administers a detailed labour force inventory questionnaire each month to a scientifically-selected sample drawn from about 98% of the Canadian labour force. The two provincial governments involved have arranged for the inclusion of a single survey pertaining to migration to be administered as a "piggy back" survey. The data printouts from this survey are now being generated, but they have not yet been analyzed.

The Alberta-B.C. survey contains 30 questions pertaining to respondents' languages and educational qualifications, place of birth, and, where relevant, his or her most recent move. Questions are asked about the province of origin, reasons for moving, and employment search behaviour and actual employment prior to and following their arrival in Alberta/B.C.

The survey provides data on persons arriving in the province. Through *inter-provincial cooperation*, it would be possible to study outmigration by exchanging relevant data with the other provinces. For example, British Columbia would send data to Alberta on migrants from Alberta in exchange for data on British Columbia migrants to Alberta.

If this experimental survey proves to be effective, the approach could eventually be extended to cover the entire country at regular intervals (e.g., annually). This could provide a very valuable means of monitoring migration trends. Use of a "piggy back" format eliminates most of the expense involved in selecting a sample and administering a questionnaire. Since the labour force survey is run by the Canadian government, problems of coordination and standardization across the nation would be minimized.

(iv) Data from Administrative Files

All levels of government maintain files containing the addresses of persons having a specified characteristic, or participating in a certain programme. These files have considerable potential for monitoring migration. Generally, this is accomplished by comparing two generations of the same file in order to classify and count changes in address and numbers registered.

To be useful for migration study purposes, administrative files should have a number of characteristics:

They should be computerized; the cost of manpower required to process large data files manually would be prohibitive.

Locational information should be in a form which can be readily analyzed by computer, for example, postal codes or some municipal or areal coding system.

The coverage of the file should be as complete as possible, at least within a defined sector of the total population.

Where coverage is incomplete, the excluded population should, as far as possible, be identical to the enumerated population, and the extent of under-enumeration must be known.

There should be some control of the accuracy of address information, either in the form of meaningful incentives for registrants to promptly report address changes, or in the form of effective government programmes to keep the file "clean."

Data from the file must be accessible to some agency interested in generating meaningful data on population mobility.

Ideally, it should be possible to identify inter-provincial outmigrants and in-migrants, as well as intra-provincial migrants.

There are essentially four methods of deriving migration estimates from administrative files. Ideally, address changes for a specified time period on a single file could be classified and counted without further data manipulation being necessary. This approach remains a hypothetical ideal, since there is no file which has total coverage of the full population, as well as completely accurate address information. With sufficient commitment to maintaining a "clean" file, the three Prairie provincial health care files could approach these ideal standards, and directly provide migration data.

It is more probable that the administrative file would cover only a part of the total population. There could be incomplete registration of all cohorts or complete coverage of certain age cohorts with others being excluded totally. In either case, appropriate adjustment factors (multipliers) would be needed to compensate for the partial enumeration. This approach is used to derive estimates of inter-provincial migration from family allowance data on the movement of children between provinces.

The third approach would involve combining data from different administrative files, each pertaining to a different population cohort or to a different type of migration, in order to obtain a "total picture" of migration patterns. For example, family allowance data for the 0-17 population could be combined with old age security data for the over-65 population, and some other source for persons aged 18-64. Health care, income tax or drivers' license data might be used to study the working age population. However, none of these files focuses specifically on the 18-64 population, and none is comparable in completeness and accuracy to the family allowance and old age security files. Another disadvantage of this approach would be the much greater computing costs involved in analyzing three files separately and then combining the data obtained.

A fourth possible approach would involve the derivation of indices of migration and/or population change from a variety of

administrative files. Data from government files (e.g., family allowance, health care, old age pensions, drivers' licenses and unemployment insurance) could be combined with information on utility subscribers (e.g., telephone and electricity connections and disconnections), school enrollment data, and various other sources (e.g., housing vacancy rates, data from moving companies, etc.) to obtain estimates of migration. Such a system might be developed if each of the available files were deemed to have some utility, but to be inadequate as a data source on its own. With the right combination of sources, the particular strengths of individual files would compensate for weaknesses in the coverage of other files.

Migration data obtained from administrative files will be only as accurate as the original data, plus the appropriateness of the methodology used to extract the migration information. Unfortunately, these files are designed for other administrative purposes. Data relevant to the study of migration are generally incomplete, partly out of date and stored in a less than ideal format. The agencies administering the files are generally reluctant to make systems changes which will not be of direct benefit to themselves.

The potential for using administrative files to monitor migration has increased in recent years due to the improvement in computer technology, and the development of techniques to regionalize postal code information. As experience grows in using these files as a routine data source, the development of more sophisticated and sensitive methodologies can be anticipated.

The major advantage of monitoring techniques, particularly those using administrative files, is the fact that migration is being measured directly. With the right methodology, investigators can have some certainty that trends which they uncover are real. With indirect methodologies, such as econometric modelling or the residual method, there is no means of immediately confirming that the migration trends which are said to exist are actually occurring. There is always the very real possibility that the model will not be valid in the present place or time, or that the residual term actually represents enumeration errors rather than the net number of migrants.

Estimates derived from the residual method and forecasting methodologies certainly have their utility. However, they can never substitute for a method of actually counting the number of migrants in the same way that births, deaths and total population are presently counted. Consequently, the focus of this report is on monitoring migration using current administrative files.

2. INVENTORY OF ADMINISTRATIVE FILES POTENTIALLY USEFUL IN MIGRATION STUDIES

A variety of administrative files are presently used in some way to derive migration estimates. Other files have been identified as possible data sources. An attempt is made here to assess the strengths and weaknesses of these files.

The chapter is divided into two sections. The first part deals with five files judged to have particular potential as a source of migration data. These files are analyzed in considerable detail. The second part of the chapter provides brief assessments of a number of other files which seem to have significantly less potential for deriving migration data.

2.1 FILES WITH MAJOR POTENTIAL

The five files described in greater detail are as follows:

2.1.1 Saskatchewan Hospital Services Plan Master Registration File
2.1.2 Alberta Health Care Insurance Plan Master Registration File
2.1.3 Manitoba Health Services Commission Master Registry Data Base
2.1.4 Family Allowance Accounts (Health and Welfare Canada)
2.1.5 Income Tax Files (Revenue Canada).

These files are described and assessed with respect to various criteria:

Population covered
File structure
Geographical breakdown
Methodology used to maintain the file
Accessibility and documentation
Present uses of the file
Overall assessment as a source of migration data
- (a) Strengths
- (b) Weaknesses
- (c) General assessment
- (d) Recommendations for improving the file.

2.1.1 Saskatchewan Hospital Services Plan (SHSP) — Master Registration File (MRF)

Population Covered

Coverage is extended to all residents of Saskatchewan, a resident being defined as a person legally entitled to remain in Canada who makes his home and is normally present in Saskatchewan.

In addition to people actually resident in the province, coverage is extended to:

(i) Inter-provincial migrants originating in Saskatchewan, until they become eligible for coverage in their new province of residence.
(ii) Saskatchewan residents who are temporarily absent for up to 12 months (e.g., for education, temporary employment, travel, etc.).
(iii) Immigrants (international) to Saskatchewan immediately upon establishing residence in the province.
(iv) Special categories of non-immigrants, including students, dependants of federal government employees, diplomats, etc.

Coverage is NOT provided for:

(i) Inter-provincial in-migrants until the beginning of their third month in Saskatchewan.
(ii) Temporary migrants to Saskatchewan.
(iii) Persons covered by federal health plans, namely the R.C.M.P., armed forces and penitentiary inmates. As of June 1976, there were 1,652 armed forces personnel and 1,141 members of the R.C.M.P. in Saskatchewan, representing 0.3% of the province's population.
(iv) Tourists, transients, etc.

There was a 2.3% discrepancy between SHSP and census population estimates for 1976. This has since been reduced to a less than 2% discrepancy between SHSP's and Statistics Canada's estimates. Thus, the SHSP population estimate appears to be quite accurate. Further data on SHSP/census differences are given in Part 4, Geographical Breakdown, below.

File Structure

The SHSP Master Registration File groups beneficiaries by family units, each family unit containing the records for individual family members. Records are identified by 6-digit registration numbers arranged in ascending order on the SHSP MRF.

New registration numbers are provided to persons reaching the age of 18, i.e., they are removed from their parents' file and registered as a distinct family unit.

The MRF is updated each week in accordance with new informa-

tion received concerning births, deaths, marriages, separations, migrations, etc. Whenever a change of family status occurs (e.g., marriage, separation) a new registration number is issued and the old registration is cancelled. A cross reference to the previous registration is always maintained on the file.

The MRF is maintained as a single file — special indicator codes are used to identify temporarily absent residents, inactive accounts, etc.

Socio-demographic variables available are:

- sex
- age (from month and year of birth)
- marital status
- family composition (excluding over-18 children still resident at home).

These data are maintained for all individuals registered on the file. There has been no study of the accuracy of recorded information. However, since there is an annual mail-out of registration forms, registrants have the opportunity to detect incorrect information found on their files.

Geographical Breakdown

Geographical location is given in two ways:

- postal address, including the postal code
- a 5 digit residence code (3 digits for municipality and 2 for place).

The residence code is being used in current efforts to develop a program to monitor migration using the SHSP MRF.

The accuracy of population estimates according to geographical location varies considerably. The overall SHSP/census discrepancy in 1976 was 2.3%. Urban population estimates from the same sources differed by a similar margin. Discrepancies were greater for smaller municipalities — SHSP being on average 7% above the census value for towns and villages, and an average of 6% lower for rural municipalities. This pattern reflects the tendency of many rural residents to have a mailing address in a nearby town. This should not be a problem if comparatively large data units (e.g., census divisions or urban centres) were studied. It would be a significant problem if data were required for individual small communities or rural municipalities.

The discrepancy between SHSP and census estimates for Indian reserve populations, i.e., 39,532 for SHSP in 1976 and 25,296 for the census of the same year, is very substantial. It is probable that Indian under-enumeration in the census exceeds that for non-Indians. The retention of a reserve "permanent" address (often c/o the band office) by Indians living off the reserve at the time of enumeration may also contribute to the discrepancy.

Methodology Used to Maintain the File

There is no positive incentive for registrants who have moved to report address changes, since coverage is not dependent on the payment of fees. However, many people may assume that their coverage would be rendered invalid if their registration information were found to be erroneous. This fear of losing coverage may act as an incentive to report address changes.

The incentive for reporting in-migration to Saskatchewan would appear to be greater than that for reporting out-migration. Since SHSP provides free care, migrants are likely to register quickly. Conversely, when moving to provinces with fee-paying health insurance plans, people may delay registering themselves, hoping to maintain their free Saskatchewan coverage a while longer. In particular, there is no incentive to report emigration to other countries, and no effective way of readily identifying such emigrants.

The MRF records the date of commencement of coverage, rather than the date of moving or even of notification, for new registrants. Likewise, the effective date for the termination of coverage is recorded for out-migrants.

Data on time lags associated with file updating are unavailable. In particular, there is no information on time lags between migration (the event) and file updating. These time lags may vary from province to province (in the case of out-migration), depending on the efficiency of other provincial governments. Since the MRF records only date of coverage status change, rather than actual migration date, errors associated with time lags in reporting cannot be traced.

As previously mentioned, the time lag for out-migrants is likely to exceed that for in-migrants, due to Saskatchewan's free care. It is suspected that there would be a higher incidence of non-reporting or late reporting of migration among intra-provincial than inter-provincial migrants, since intra-provincial migrants do not stand to lose their coverage by moving.

The SHSP expends a great deal of effort in order to keep its MRF "clean" by identifying persons who have left the province, changed address, died, etc. Accuracy is maintained in various ways:

(a) Updating according to information voluntarily supplied by registrants concerning changes in their status or address.
(b) New registration cards are mailed to each registrant annually.
(c) When the registrant has moved, the post office has agreed to return the card and supply the new address, if possible.
(d) Error reports are generated with each weekly file update to identify "problem entries." Further procedures are initiated to trace the source of errors.
(e) There are six regional field officers whose duties include helping to trace "lost" registrants.

(f) A "Soundex" system is used to match names which are pronounced alike, but which may be spelled differently. This may help to identify registrants who have gone missing, perhaps because of a spelling error of a name on a claim.
(g) Other administrative agencies (e.g., driver licensing agencies and social service agencies) may be consulted in an effort to trace migrants.
(h) Cross-referencing between old and new registration numbers ensures that individuals can be traced back through time, and that "old" registrations are invalidated.
(i) Claims received for payment for services rendered are routinely cross-referenced with MRF information to identify discrepancies. Such files are then "flagged" and procedures initiated to clarify the status of the registrant.
(j) Special efforts are made to maintain address information for Indians. In addition to the special arrangements with the post office (see (c)) for address updating, listings of Indian beneficiaries by band are distributed to field representatives for discussion and review with zone or band officials.

The above efforts to maintain the MRF as accurately as possible are both extensive and expensive. Although these procedures result in a comparatively "clean" file, problems remain. There is certainly no guarantee that post office personnel or new residents at a given address follow SHSP instructions about notifying SHSP whenever the addressee has moved. Tracing emigrants to other countries remains a problem.

Accessibility and Documentation

The SHSP MRF is thoroughly documented. A 1977 report by H. Danchilla, entitled *The Feasibility of Utilizing the MRF of the SHSP for Demographic Statistical Purposes*, is particularly valuable. Data on the population covered by municipality, family size, age, sex, etc., are regularly issued.

The potential value of the MRF for making demographic estimates has been accepted. Saskatchewan Bureau of Statistics is already working in co-operation with SHSP to develop the MRF as a demographic data base.

Present Uses of File

The primary purpose of the file is to maintain basic information on individuals who are eligible for SHSP coverage. Automatic computer checks confirm whether each medical claim pertains to an individual who is eligible for coverage. The MRF is also routinely used in connection with special drug, dental and immunization plans.

Other departments using the MRF include Municipal Affairs, which uses it to determine eligibility for Home Owner's grants and in

estimating municipal populations for the allocation of funds to municipalities.

Saskatchewan Bureau of Statistics is currently preparing a computer program which will permit it to make inter-provincial and intra-provincial migration estimates on the basis of MRF address changes.

Overall Assessment as Source of Migration Data

(a) Strengths

Virtually 100% of the population of the province is covered. There are no significant systematic omissions (e.g., by age, sex, socio-economic status or region).

The most important socio-demographic variables are available from the MRF. The presence of both postal codes and locational codes permits flexibility in regionalizing derived data.

Considerable efforts are made by SHSP to keep the file "clean." With the discrepancy between SHSP and Statscan estimates of Saskatchewan being in the neighbourhood of 2%, there is evidence that the file is relatively "clean."

The file is under provincial control, and is not, therefore, subject to restrictions in access or changes in coverage which always exist with federal files. It is already being used by Saskatchewan government agencies, particularly the Bureau of Statistics, as a demographic data source.

The time lag in reporting migration is unquantified, but is probably second only to family allowance for punctuality. The annual mailout of registration forms is particularly useful in identifying migrants who have not reported address changes.

(b) Weaknesses

As long as Ontario and Quebec do not provide full cooperation in the exchange of inter-provincial health care registration transfers, the utility of health care files for estimating inter-provincial migration will be severely limited. About 14% of Saskatchewan's out-migrants go to either Ontario or Quebec, according to Statistics Canada. These moves are not recorded, except when out-migrants voluntarily report their departure from the province to SHSP.

The lesser incentive for reporting migration out of Saskatchewan (especially to other countries) than for reporting migration into Saskatchewan represents a significant source of error.

The actual time of migration is not available on the MRF. Rather, the date of commencement of coverage is recorded. Thus, some error in estimating the time of migration is inevitable.

Some residents of Saskatchewan are not registered on the MRF.

In particular, those who are covered by a federal health plan are excluded.

The use of mailing address rather than actual residential address creates excessive inaccuracy in population estimates for villages, small towns and rural municipalities. Thus, although the MRF can provide reasonable estimates for larger areas (e.g., census divisions) or urban centres, it is not suitable for monitoring migration trends in individual small communities.

There are various categories of people whose registration status changes, but whose status as migrants may remain in doubt. For example, young people initially acquiring their own registration number may or may not have left home. Persons listed as temporarily absent from or present in the province vary considerably in the duration and nature of their temporary migration.

(c) General Assessment

This is perhaps the best potential source of intra-provincial migration data for Saskatchewan. The file provides virtually universal coverage of the population, and considerable attention is paid to maintaining its accuracy. With the changes suggested in the following section, the utility of the file could be further enhanced.

A computer program designed to generate intra-provincial migration data is now being developed. It is too early to evaluate this experiment. If these efforts are successful, other provinces will be encouraged to commit more resources for improving the accuracy of registration data in their health care files, making appropriate systems adjustments, and developing computer programs to monitor migration.

The SHSP MRF is not yet an adequate source, by itself, for data on inter-provincial and international migration. The non-participation of Ontario and Quebec remains the biggest hurdle, one which is beyond the control of Saskatchewan. It may be possible to develop a methodology using other sources, either drivers' license transfers or family allowance transfers, to make estimates of out-migration to Ontario and Quebec.

Health care data have one significant advantage over family allowance transfers (present capability, not potential capability) as a tool for studying inter-provincial and international migration, namely, it is possible to identify areas of origin and destination of such migrants within the province rather than giving only provincial totals. It is only with such data that the full migration picture at the local level may be assessed. It is somewhat of a waste to obtain detailed information on intra-provincial migrants while knowing nothing about the sub-provincial dynamics of inter-provincial and international migration.

(d) Recommendations for Improving the File

The utility of the MRF for migration estimation would be enhanced if the actual date of establishing residence were recorded, in addition to the date of commencement of coverage.

Basic data on persons covered by a federal health plan could be included in the MRF, together with an indicator to show that they are covered by the federal plan. This would help to bring the MRF closer to being a universal listing of the province's population, and would greatly facilitate the recovery of accurate information on family composition for the entire population.

At present, the MRF has two geographical codes, both of which are derived from the mailing address. The postal code should remain as an indicator of mailing address. Its utility for estimating migration to/from small localities would be enhanced if the residence code was altered to show actual residential location, rather than mailing address.

Retention on the MRF of the old postal code or locational code following a change of address, together with the date of said change, would greatly simplify the process of extracting migration data from the MRF.

At present, information on the destination of migrants going to other provinces is not retained on the MRF. A single "left the province" indicator is used. Studies of inter-provincial migration would be enhanced if this code were further elaborated to distinguish between provinces of destination. This will not overcome the problem of non-cooperation by Ontario and Quebec in the information exchange program, but it would greatly enhance the utility of the file for obtaining data on migration to the other provinces.

It would be much easier, and cheaper in terms of computer time, to obtain migration estimates if pertinent information (socio-demographic, geographical and SHSP status information) were automatically accumulated on a drop-file in connection with any change of address or SHSP status of a registrant, whether new or old. At present, it is necessary to conduct an expensive file matching procedure to study migration between two points in time. The extensive procedures used to maintain the accuracy of the file must be continued if the file is to remain sufficiently accurate for making migration estimates.

A sample survey should be conducted to determine the migration characteristics and personal traits of people listed as "temporary migrants" to or from the province. Since there is considerable variation in the nature of temporary migration, the present catch-all "temporary" category is not very meaningful. Results from the sample survey could provide a basis for modifying the classification.

A sample survey to determine time lags in reporting migration would be useful in evaluating this source of error.

2.1.2 Alberta Health Care Insurance Plan (AHCIP) — Master Registration File (MRF)

Population Covered

Coverage is extended to all Alberta residents, i.e., persons legally entitled to reside in Canada who maintain a home and normally reside in Alberta, except for certain groups which are specifically excluded.

Coverage is extended to the following categories of migrants:

(i) Migrants leaving Alberta for another province, until they become eligible for coverage in their new province of residence (normally 3 months).
(ii) Permanent emigrants (international) from Alberta for up to 3 months after they emigrate.
(iii) Persons temporarily absent for up to 12 months for a vacation, employment, etc., who intend to return to Alberta. Indefinite coverage is extended to students from, and intending to return to, Alberta who are enrolled in out-of-province educational institutions. Missionaries for a registered charity and persons on educational leave from employment may be temporarily absent for up to 24 months without losing coverage.

Coverage is *not* extended to:

(i) Persons deciding to opt out of the plan. This represents only about 0.015% of the eligible population. They must first register with the Plan before being permitted to opt out.
(ii) In-migrants from another province intending to establish a permanent residence in Alberta until the first day of the third month after their arrival in the province. International immigrants are eligible for coverage upon arrival in Alberta.
(iii) Temporary migrants to Alberta.
(iv) Persons covered by federal health care plans, namely the armed forces, R.C.M.P. and federal penitentiary inmates.

Alberta Bureau of Statistics (ABS) has analyzed the AHCIP Master Registration File's coverage in comparison to Statscan and ABS population estimates for Alberta. The apparent over-count in the AHCIP file has been found to be significant and larger in 1980 than in 1976.

The largest problem occurs in the young adult cohorts, for which the AHCIP-registered population is significantly higher than the estimated total populations of these cohorts. Otherwise, there is reasonably close correspondence between the AHCIP and Statscan age-specific populations. This discrepancy in the young adult data reflects the high level of migratory activity of this cohort relative to others. The fact that Ontario and Quebec, unlike other provinces, do not inform AHCIP about in-migration from Alberta is probably the main source of error. However, the discrepancy might also be partially attributable to under-estimation by Stascan and ABS of the volume of young adult migration to Alberta.

The degree of over-counting by AHCIP varies according to the time lag between the reference date for data analysis and the data tape date. This is because of on-going corrections to registration data, particularly because of delayed reporting of changes in address or registration status. Using a three month time lag, ABS found that the apparent AHCIP registration over-count relative to ABS population estimates had varied from 4.69% in 1976, 5.22% in 1977, 4.72% in 1978, 5.22% in 1979 to 6.38% in 1980. Slightly lower discrepancies are obtained if a longer time lag is permitted, but this implies production of less current data.

File Structure

Persons eligible for coverage are registered on the MRF together with his/her dependants. Dependants include children less than 21 years old who are single and wholly dependent on the parent, single children less than 25 years old who are in full-time attendance at an educational institution, infirm single children over 21, and foster children.

Independent registration numbers are issued to persons no longer qualifying as dependants due to divorce, separation, reaching the age of 21, or becoming financially independent (in the case of children under 21).

Birth, adoption, marriage or reconciliation after separation will result in registration changes. In such cases, newborns and persons previously listed on the MRF as independent registrants are added to the appropriate registration as dependants, with any previous registration numbers being deactivated.

Socio-demographic data which may be extracted from the file are sex, age (based on month and year of birth), marital status and family composition (excluding independent children). However, the marital status and family composition data are of dubious accuracy.

Since 1976 AHCIP has maintained a separate file (additional to the MRF) on which information concerning new registrants from outside Alberta is maintained. This additional file includes dates of residency and effective registration with AHCIP, province or country of origin, and destination (census division) within Alberta. Unfortunately, there is no parallel file to provide information on out-migrants from the province.

Geographical Breakdown

Postal codes of residents' addresses provide a basis for geocoding the data. These codes are already used as a basis for allocating registration data to sub-provincial areal units, using a postal code translator program developed by ABS.

The presence on the AHCIP Master Registration File of a large number of registrations with "unknown" postal codes has been a significant problem for obtaining sub-provincial data. The total number of registrants with unknown regions has been reduced from about 250,000 in mid-1976 to 36,000 in mid-1978 and 16,000 in mid-1980, but analysis by Alberta Bureau of Statistics shows registrations which cannot be allocated to a region to be again rising slowly.

The use of postal codes inevitably results in some misclassification of registrants' places of residence in rural areas, particularly since many rural residents have post office boxes in nearby towns or villages. Individual postal code areas in rural districts often fall within two census divisions or municipalities, creating further allocation difficulties in regionalizing the data.

Methodology Used to Maintain the File

The AHCIP MRF lists 2,228,037 registrants as of June 1, 1980. This represents 136,717 more people than were estimated by Alberta Bureau of Statistics to reside in Alberta at that time, or a discrepancy of 6.38%, using a three month time lag. As previously noted, this discrepancy has increased significantly since 1976.

The heavy flow of migrants into Alberta, as well as high rates of turn-over among recent migrants has increased the administrative burden facing AHCIP. During the 1977-80 period, 180,000 new registrants originating outside Alberta were recorded for C.D. 6 (Calgary) alone. Persons leaving Alberta as emigrants to other countries or moving to Ontario or Quebec who do not voluntarily notify the Plan remain on the file, inflating the number of registrants. Although Alberta eventually receives notification when persons move to provinces other than Ontario and Quebec there is a variable and significant time lag involved in this notification process.

A second source of error occurs when young adults who reach the age of 21 or who marry at an earlier age, are registered on their own account without having their former registrations as dependants cancelled. In such cases, a double counting error occurs.

AHCIP collects premiums for health care insurance, unlike the Manitoba and Saskatchewan health care Commissions. The mailing of premium notices would seem to represent an ideal means of identifying persons who had moved, either out of the province or to a new Alberta address. However, it is AHCIP policy not to deny coverage for non-payment of fees. Registrants who are in arrears and/or apparently "lost" do not have their coverage cancelled for 18 months after their file is flagged. At present, approximately 40,000 registrants have been flagged for no longer being in contact with AHCIP. Registrations are cancelled after 18 months in arrears, with the notification on the file that the person is "deemed out of the province."

Approximately two-thirds of registrants in Alberta are on group payment plans at their place of employment. Employers may delay notifying the AHCIP of employee address changes, or fail to do so, especially if the employment status of the registrant does not change. Furthermore, there is no incentive for employers to notify the Plan of address changes affecting dependants, but not the head of household. Changes in registration status of dependants are likewise liable to remain unreported by employers responsible for the payment of fees.

Notifications of address change received from individuals or from employers concerning persons on group plans are processed continuously. There is a complete up-date of the MRF weekly. However, with the substantial increase in the registered population and the rate of population mobility, the time lag in processing file amendments has tended to increase.

A number of administrative procedures are used to identify "problem" registrations. Claims for service fees are routinely checked against the MRF to confirm eligibility. However, due to staff shortages and the heavy claims load, no attempt is made to verify address or other registration information currently on the file. If a premium notice is returned undelivered by the post office, the registration is flagged, but remains on the system. The Plan consults the Department of Indian Affairs with respect to address information for Treaty Indian registrants.

Statements of claims made, together with a request that changes in address or registration status be made known to the Plan, are sent twice annually to all registrants. However, the response to these requests for information tends to be poor. Even if an individual informs the employer responsible for paying his premium about address or status changes, there is no guarantee that these amendments will be forwarded to AHCIP.

Registrations which are due for cancellation, whether because of out-migration from the province, prolonged non-payment of fees, or a change in registration status, are flagged as being currently invalid. However, the registration data remain on the system indefinitely. Former registration numbers are reactivated when appropriate, such as following separation or divorce, or in the case of return migration to Alberta.

The Master Registration File lists the registration date, but not the actual date of residency, for new registrants. Provinces of origin and destination for inter-provincial migrants are not recorded on the MRF.

A separate file is maintained to store more comprehensive information on all new in-migrants to Alberta. For example, province or country of origin and destination within Alberta are recorded. The in-

migrant file and the MRF are linked, so that data pertaining to new registrants from outside Alberta are recorded simultaneously on both.

Accessibility and Documentation

AHCIP has an agreement with Alberta Bureau of Statistics giving the Bureau access to its Master Registration File for demographic estimation purposes. ABS currently obtains some demographic data from the file; the Bureau intends to develop methodologies to greatly expand the use of the MRF as a demographic data base.

A set of data on in-migrants to Alberta from other provinces and countries is produced monthly by AHCIP in cooperation with Alberta Advanced Education and Manpower. Neither out-migration nor intra-provincial migration is covered.

Despite the fact that AHCIP files are now used for demographic estimation purposes, accessibility to these files is rather carefully restricted at present to ensure their confidentiality. Documentation on the health care system and maintenance of the MRF is not made available to outsiders.

Present Uses of the File

The file is primarily maintained for the routine administrative use of the AHCIP. It supplies a list of persons eligible for coverage under the terms of the Alberta Health Care Insurance Act. These records are routinely checked when claims for service fees are made.

Alberta Hospitals and Medical Care uses data generated from the file for planning purposes. Using postal codes and the ABS postal code translator file, registrants are allocated to hospital districts in the province. This enables the monitoring of population trends and the early identification of projected changes in medical service needs. Other data sources such as the Census of Canada or municipal censuses cannot readily be adapted for this purpose since hospital district boundaries often do not correspond to census or municipal boundaries.

The file is also currently used as a source of demographic data. Alberta Bureau of Statistics has access to the file for demographic purposes. Monthly printouts of data on in-migrants to the province are produced by AHCIP, and are sent to Alberta Advanced Education and Manpower.

The ABS has undertaken a project known as the Alberta Health Care Data Development Project to evaluate and develop Alberta health care data as a potential source of small area demographic information. One of the Project's objectives is to develop recommendations for improving the statistical utility of AHCIP data. These data would be used as a basis for small area population estimates and monitoring migration.

Overall Assessment as a Source of Migration Data

(a) Strengths

The Alberta health care MRF gives the most complete coverage of the province's population of any government file. Virtually every Albertan is registered, with the exception of persons covered by federal plans, temporary in-migrants, and recent in-migrants who are still unregistered. There is no evidence of significant systematic omissions, e.g., by sex, age, income, or region in the file's coverage.

The MRF contains postal code information on all but about 16,000 registrants. Using a postal code translator program postal codes may be used to assign registrants to any user-specified set of regions or localities. An Alberta postal code translator has been developed by ABS.

The MRF provides some socio-economic information on registrants, including age (from birth date), sex, marital status and family structure.

The separate data file concerning post-1976 in-migration to Alberta provides a detailed profile of in-migrants according to both their month of establishing residency in Alberta and of effective registration. Data are provided on migrants' provinces and countries of origin, destinations within Alberta, age, sex and family status. This is an excellent source of information on the in-migrant component of Alberta's migration system.

(b) Weaknesses

The discrepancy between AHCIP's registered population and the provincial population according to ABS estimates is currently approaching 6.5%, and it has been growing. Although this discrepancy may be partially attributable to errors in intercensal population estimation, problems associated with the MRF file and the accuracy of its data are a more likely cause. As long as the apparent over-count is so large, demographic data obtained from the file will be of questionable validity, especially data pertaining to small areas.

Much of the discrepancy may be attributed to rapid population growth and turnover in the province. Persons moving to Ontario, Quebec and outside Canada very frequently remain registered in Alberta because of failure to notify the Plan that they are no longer resident in the province. Persons going to the other provinces can be identified as a result of the inter-provincial exchange of information, but time lags may be significant.

There is no real incentive for persons moving intra-provincially or temporarily leaving the province to report address changes. Coverage is not dependent on the accuracy of registration information or even up

to date payment of fees. The lack of incentive to report changes applies especially to dependants in a family registration where fees are paid by the employer through a group plan. Such dependants may remain on their parent's file for years after leaving the province to study elsewhere, or gaining their own registration numbers.

The AHCIP administrative procedures also contribute to the problem. For example, it should be possible to reduce double registrations to an insignificant number by ensuring that there is cross-referencing to the old registration number for new registrants or amendments involving addition of a new dependant to a file. Old registrations should be routinely cancelled in conjunction with the processing of new or amended registrations. Not surprisingly, AHCIP is more interested in ensuring that all eligible persons are registered than in having an accurate record of the province's population. Thus, various "problem" accounts are liable to remain on the system for a considerable period of time.

The Master Registration File does not list certain information essential for monitoring inter-provincial and international migration. The province or country of origin for in-migrants and of destination for out-migrants is not included on the MRF. The date of residency in Alberta is also excluded. Although the above information for in-migrants is available from the separate in-migrant file, detailed data on persons leaving Alberta are not kept. A single "left the province" code is used to identify out-migrants on the MRF. The inadequacy of currently-maintained out-migrant data is a significant weakness of the AHCIP files with respect to demographic forecasting.

The migration status of certain categories of people cannot be readily ascertained at present. For example, marriage, divorce, attending university or registering for the first time as an independent registrant is often associated with migration. In most cases, it will be possible to readily identify neither those people who have migrated, nor their places of origin.

The main problems associated with studying migration are those discussed above pertaining to the non-reporting or delayed reporting of migration, or the inadequate collection and recording of migration information by AHCIP. Other problems are related to dependence on postal codes for regionalization. This is a source of error in rural districts and small towns, since residential and mailing addresses often differ, especially in rural areas. The "unknown" postal code component remains a relatively large source of error.

The non-coverage of persons covered by federal health care plans is a source of error which may be disproportionately significant since some federal employees tend to be very mobile (e.g., armed forces).

(c) General Assessment

To quote Alberta Bureau of Statistics, the Alberta health care data are at present "more likely to capture population *trends* than *magnitudes*. The main effect of the data limitations is to over-estimate population." Moreover, these limitations become increasingly more problematical as the size of geographical area/population is reduced.

Alberta's health care MRF has not yet achieved the standards of accuracy of Saskatchewan's. There is a significant over-count problem in the AHCIP file, due to the continued presence on the file of thousands of people no longer resident in the province, and to some double counting. Address information for persons resident in the province is of unknown reliability. Many employers and individual registrants are not inclined to report address changes to the Plan. AHCIP, in cooperation with ABS, is studying ways of improving file coverage and maintenance procedures.

The file remains the most complete and unbiased (by age, sex, income, etc.) listing of Alberta's population. Thus, in the longer run it has excellent possibilities as a demographic data base, assuming that certain systems changes are implemented. The inclusion of postal codes provides a basis for making intra-provincial estimates. With the inclusion of adequate origin/destination codes, it would be possible to monitor inter-provincial mobility, except for out-migration to Ontario and Quebec.

The Alberta MRF file, with the inclusion of out-migration destination and in-migration origin codes, could serve as a basis for estimating total migration from family allowance transfers at a sub-provincial scale. Health care data can provide valuable migration *profiles*, even if the incompleteness of registration makes it impossible to obtain actual numbers of people in the various migration streams. The migration profiles derived from health care data may be used to calibrate multipliers for matching with corresponding data on family allowance transfers. This approach to estimating total migration is discussed in greater detail in Chapter 4.

(d) Recommendations for Improving the File

At present, it is not possible to monitor inter-provincial and international migration flows for the province of Alberta. Gross in-migration data may be obtained for sub-provincial areas using the in-migrant file. However, out-migration and net migration trends are not available. AHCIP should expand its MRF data on inter-provincial and international migrants. The province or country of origin and date of residency should be noted for in-migrants. The general "left the province" indicator for out-migrants should be elaborated to show their destination. These relatively simple systems changes would transform the MRF into a data base for all categories of migration.

An alternate approach would involve the establishment of a new file for all out-migrants to show the place of origin in Alberta, date of move and destination. The new out-migrant and existing in-migrant files would provide data on inter-provincial and international migration directly, while address changes recorded between two points in time on the MRF would provide data on intra-provincial mobility. This option is less attractive than the first one, namely incorporating all necessary data into the MRF.

For intra-provincial migrants, retention of the old postal code and date of address change would greatly facilitate the study of migration.

The present somewhat "dirty" condition of the MRF with respect to the number of residents of Alberta as well as current addresses represents a significant problem for those wishing to derive demographic data from the file. The non-cooperation of Ontario and Quebec in the inter-provincial notification programme for migrants is a significant problem, but beyond the jurisdiction of AHCIP. However, it should be possible to reduce the level of error associated with intra-provincial migration. This might be done by requiring all registrants to return a form confirming or updating registration status and address information each year. Failure to respond to the request and a follow-up mailing would lead to the registration being flagged. The employer, in the case of group plan registrants, or other government agencies might be contacted in an effort to trace the "missing" registrants. Unfortunately, staff shortages at AHCIP make it unlikely that a comprehensive system of identifying and resolving errors in the MRF can be implemented in the foreseeable future. Nevertheless, improvements in file accuracy will have to be achieved if the file is to serve as a primary data source for current population estimates, especially if small area populations are to be studied.

Double counting of people, generally as a result of their transfer from one registration to another without the old registration being cancelled, is a major system problem. This source of error can be reduced only if persons previously registered on the system who are changing their registration status are required to provide information on their previous registration, and if necessary administrative action is taken simultaneously on the old and new registrations.

Once the above major sources of error are reduced, further improvement in the quality of the file as a demographic data base could be achieved if persons covered by federal health care plans were included in the MRF with a special indicator showing them to be uninsured residents. This would bring the file significantly closer to the ideal of being a universal listing of the province's population.

Although postal codes are a valuable and flexible source of geographical location, their use inevitably introduces a significant source

of error for rural municipalities. If accurate small area population estimates are required, there is no substitute for including a specific locational code to identify the place of residence.

Substantial savings in computer time could be achieved if a drop file system were initiated for migration studies. In such a system, basic data on registrants changing their address and/or registration status would be accumulated on a special file. This would eliminate the need for awkward file-matching procedures presently necessary. It would also make it much easier to ascertain whether migration took place in connection with such status changes as marriage, divorce or becoming an independent registrant. At present, it is very difficult to determine the former addresses of such "new" registrants. With a drop file system, both the new postal code and the former postal code (from the "old" registration) could be accumulated on the drop file at the time of administrative action.

2.1.3 Manitoba Health Services Commission (MHSC) Master Registry Data Base (MRDB)

Population Covered

Coverage is available to all Manitoba residents, i.e., persons legally entitled to remain in Canada and normally resident in Manitoba.

Coverage is also extended to:

(i) Inter-provincial migrants originating in Manitoba, until they become eligible for coverage in their new province of residence.
(ii) Temporary out-migrants, who intend to resume residence in Manitoba within 12 months.
(iii) Special categories of non-migrants, including dependants of federal government employees (e.g., R.C.M.P. and armed forces) and diplomats.

Coverage is *not* extended to:

(i) Inter-provincial migrants until the beginning of their third month in Manitoba, as they are covered by their home province until this time. Immigrants to Canada are eligible for coverage from the first day of their arrival in Manitoba.
(ii) Temporary migrants to Manitoba.
(iii) Family heads moving to Manitoba from other provinces in advance of their families, if the family is expected to join them within 12 months.
(iv) Persons covered by federal health care plans. Members of the R.C.M.P. and armed forces and penitentiary inmates represent the major categories of persons covered by federal health care plans.
(v) Tourists, transients and visitors.

Comparison of MHSC population data and Statscan data provides evidence of significant overcounting in the MHSC master file. These differences are partially accounted for by the estimated 2% census under-enumeration, but are primarily the result of inadequate measures in recent years to keep the MHSC file free of ineligible registrants. The MHSC-Statscan discrepancy has continued to increase over the past decade:

	Difference between MHSC and Statscan estimates of Manitoba's population	% difference between MHSC and Statscan estimates
1971	30,300	3.1
1972	26,500	2.7
1973	31,700	3.2
1974	46,600	4.6
1975	42,100	4.2
1976	50,300	4.9
1977	54,400	5.3
1978	61,000	5.9
1979	66,900	6.5

Programs have been initiated in 1981 to purge the MRDB of registrants no longer eligible for coverage. The overcount has already been significantly reduced as a result of these measures. Until now, the size of the gap has seriously limited the utility of the MRDB for migration estimation purposes. It is too early to determine whether additional cleanup procedures will be necessary.

File Structure

The MRDB records registrants according to family units. Each record contains data concerning the family head, followed by information on each dependant. Each record is identified with a 6 digit registration code. Wherever appropriate, cross-reference registration numbers are maintained, i.e., for Manitoba residents who change their registration status as a result of marriage, reaching the age of 19, separation, etc.

The MRDB records are updated weekly to reflect reported changes in address, coverage status, etc. Persons reaching the age of 19 obtain their own registration number, thus becoming a family head for registration purposes.

The data base contains four types of records namely (a) family head name record, (b) family head information record, (c) family head address record, and (d) dependant record.

Socio-demographic data available from the file include sex, age (month and year of birth), marital status and family composition (excluding children more than 18 years old). There has been no study to evaluate the accuracy of these data.

Geographical Breakdown

Residents are geocoded in two ways, namely through the use of postal codes and with a 3-digit residential code. The residential code includes specific numbers to identify Indian bands.

For migrants to the province, a code is used to identify the province of previous residence. International migrants are only broken down into "U.S.A." and "other." Similar data are maintained on the province or country of destination for out-migrants from Manitoba.

Because of the use of residential addresses for the residential code, the problems associated with using postal codes in rural areas (i.e., rural residents who maintain post office addresses in a village or town, and are thus wrongly identified as town residents) are minimized in the case of Manitoba.

Methodology Used to Maintain the File

The overcount problem has been greater for the Manitoba health care file than for those of either Saskatchewan or Alberta. The absence of residence verification programmes between 1977 and 1980 has contributed significantly to the state of the Manitoba file. Saskatchewan has a comprehensive procedure designed to identify and trace registrations with obsolete/inaccurate information; Manitoba had few such procedures prior to 1981, due to budgetary constraints. Alberta, with its payment-for-coverage scheme, is in a position to identify a large proportion of migrants through the return of undelivered fee statements.

In Manitoba, the following procedures are used to identify "problem" registrations:

(i) If mail routinely sent to a registrant is returned undelivered to MHSC, efforts are made to find the new address using telephone books and directories, or by contacting the employer. If this search is unsuccessful, a "mail returned" flag is added to the record. Following a further 10 months of inactivity, a residential confirmation statement is sent; the registration is then cancelled if there is no response.

(ii) If a registration is inactive for a period of 12 months, a residence confirmation form is mailed. If it is returned undelivered or remains unanswered, the registration is cancelled with immediate effect, following efforts to locate the registrant. Cancelled registrations are retained on the MRDB for two years, after which they are purged.

(iii) Doctor's claims for fees in respect of a patient are routinely

checked against information on the patient according to the MRDB.

(iv) MHSC cooperates closely with the Department of Indian Affairs, band councils and National Health and Welfare to maintain complete and accurate information on Indian registrants.

(v) Cross referencing is maintained between "old" and "new" registration numbers.

(vi) Change of address cards are on display in doctors' offices.

(vii) Employers are required to notify the MHSC of employee address changes; this regulation is not enforced.

The lack of any positive incentive to report address changes, given the absence of health care premiums represents a major problem in maintaining file accuracy. This particularly applies with intra-provincial migration, but also occurs for inter-provincial movement since there is a greater incentive for prompt registration by people arriving in Manitoba where there are no premiums, than for people leaving Manitoba and migrating to those provinces where health care premiums are levied.

For migrants arriving in Manitoba, the date of commencement of coverage rather than the date of residency is recorded on the MRDB. Generally, the time lag for coverage is 3 months, but numerous errors would be inevitable if one were to assume such a time lag in all cases. Data on actual time lags in reporting address changes, both intra-provincial and inter-provincial, are unavailable.

Old addresses are not retained following a change of address.

Accessibility and Documentation

The structure of the Manitoba Health Services MRDB is documented in a report entitled "Research Handbook on the Operation of the Manitoba Health Services Commission."

The potential utility of the file for population estimation purposes has been investigated in the past. Reports on municipal populations according to the MRDB were issued twice annually until 1979, but have now been suspended until the current intensive file audit is completed. Due to the large discrepancy between Statscan and MRDB populations for Manitoba, the sensitive nature of population estimates, and the negative utility of inaccurate data, the Manitoba government has been inclined to make the health care file less, rather than more, accessible. Policy regarding future access to the health care MRDB remains uncertain. With the reduction of the population overcount achieved through the 1981 intensive file audit, MHSC is planning to resume publishing its municipal population estimates. It is reasonable to assume that certain agencies may be able to utilize MRDB data once MHSC becomes satisfied that the file is sufficiently

accurate. Inter-departmental discussions have already taken place on ways of improving the accuracy and utility of data stored on the MRDB.

An experimental computer program to estimate inter-provincial migration was tested in 1976-77. This program is no longer in circulation.

Present Uses of the File

At present, the MRDB file is used primarily for health care administrative purposes. It is the basic source of information on individuals who are eligible for health care coverage by MHSC. The file has also been used to identify the target population for the provincial immunization program.

The other use of the file, temporarily suspended, has been as a population data source for the province. Twice-yearly reports were prepared showing the populations of municipalities, Indian bands, and development regions. Age-sex breakdowns of the development region populations were provided. These population estimates were widely distributed within the Manitoba government and to municipalities for use in planning.

Overall Assessment as a Source of Migration Data

(a) Strengths

The Manitoba health care MRDB file covers virtually 100% of the population of the province. There are no significant systematic omissions, e.g., by age, sex, socio-economic status or region.

Geographical location is available in two forms, namely postal codes and residential codes (by municipality). Thus, there is considerable flexibility with respect to regionalization of derived data. Manitoba has not yet developed its own postal code translation program. However, an adjusted Canada Post program is available which permits assignment of postal codes to the appropriate municipalities.

Basic socio-demographic information is available from the file, i.e., age, sex, marital status, and family structure.

The coverage of the Indian population appears to be good, compared to alternate data sources on this particular group.

As a provincially-controlled file, the MRDB is not subject to extra-provincial controls on accessibility or changes in the coverage of the file.

(b) Weaknesses

The number of ineligible registrants on the MRDB has been excessive in recent years. (The author estimates the number may have reached 50,000 in 1980.) Although new procedures to clean the file

have significantly reduced this overcount, it is too early to declare the programme an unqualified success.

The non-participation of Ontario and Quebec in the exchange of information on inter-provincial health care registration transfers greatly reduces the utility of the file for monitoring inter-provincial migration. Data are complete for in-migration, but only partial for out-migration from Manitoba. These two provinces account for about 29% of Manitoba's out-migrants, according to Statscan.

The actual time of occurrence of migration cannot be ascertained from the MRDB. Estimates based on the time of eligibility for coverage are subject to some error.

Because there are no health care insurance premiums in Manitoba, there is a greater incentive to report in-migration to the province than out-migration. It is particularly difficult to trace international out-migrants and those going to Ontario and Quebec. The newly-reinstated programme of mailing residence verification forms to registrants inactive for at least a year means that most of these people will eventually be identified. However, the time lag following migration may be considerable.

Some residents of Manitoba are excluded from coverage, particularly those covered by a federal health care plan (R.C.M.P., armed forces and inmates in federal institutions).

There are several problem categories of registrants, particularly temporary out-migrants, and persons whose coverage has been terminated within the previous two years. The migration status of certain groups of people changing their registration status is often in doubt. For example, the registration of young people at the age of 19 or upon achieving financial independence often coincides more or less with a move away from home. Since they appear as new registrants it is necessary to check their former registration in order to determine whether the person is a migrant or not. The computer may be programmed to check former registrations, but such a procedure would greatly increase computing costs.

(c) General Assessment

The assessment depends on the comparison. The Manitoba health care file is more universal and representative of the entire Manitoba population than any alternate government file. However, it is currently less reliable than the Saskatchewan health care file.

Although the accessibility of the file to government departments for use as a demographic data base is presently very restricted, this problem should be resolved by late 1981 when the current file audit will have been completed.

An on-going commitment to improving the quality of the data

base must be a first-order priority if the MRDB is to become a reliable source of demographic data. The experience of Saskatchewan shows that a comparatively "clean" file may be obtained if sufficient effort is made to achieve this goal.

In the longer term, the file has excellent potential as a source of data on intra-provincial migration and inter-provincial in-migration to Manitoba. It is close to being universal in its coverage, includes basic socio-demographic data, and is likely to have a lesser time lag in reporting than is the case with such alternate sources as drivers' licences or income tax.

A suggested first step in developing the migration estimation capabilities of the MRDB would be the resurrection of the experimental program for intra-provincial migration estimates. Reportedly, there has been some skepticism about the accuracy of estimates generated by the program in experimental runs about 1976-77. How serious were these problems? Did they result from "bugs" in the program itself? Were there problems with certain codes referring to persons whose status as migrants is doubtful (e.g., temporary out-migrants, newly-independent 19 year old registrants, etc.)? Was the time frame for analysis unrealistic? Or, were there major problems resulting from the presence of inaccurate data in the MRDB? It is to be hoped that the migration estimation program can be re-examined and tested again when the current update of the MRDB is completed. It is only by generating such data that the utility of the program as well as the success of the file audit can be ascertained.

(d) Recommendations for Improving the File

The new mail-out procedure to identify inactive registrants is successfully identifying many persons no longer eligible for coverage. A general annual mail-out similar to that conducted in Saskatchewan would identify migrants at an earlier stage, but would be considerably more costly than the limited mail-out program. If the MRDB is to be extensively developed for demographic purposes, the general annual mailing would probably be worth the extra cost.

Other programs in use in Saskatchewan to trace migrants should be considered. A cooperative agreement with the post office for the supplying of new addresses would be valuable. The use of field staff to investigate "problem" registrations would enhance the accuracy of the file. Increased advertising may induce more people to report changes of address promptly.

Retention on the file of the old postal code following migration, together with the date of the move, would enhance utility of the file as a source for migration data. At present, migration estimates could be made from the MRDB only through a comparatively lengthy, expensive process of matching registrants from two generations of the

file. Alternately, the use of a drop-file system would simplify the study of migration. Each time a change was made in address or registration status, pertinent information (old and new locational codes, MHSC registration status, socio-demographic data, and date of change) would be accumulated on a drop-file which could be analyzed to obtain migration estimates.

Date of establishing residence and date of departure from the province should be recorded. Use of the date of commencement or termination of coverage for this purpose may introduce a significant error into the estimated temporal distribution of migration.

Very little is presently known about the quality of MRDB data in quantitative terms. Sample surveys to study the length of time lags in reporting migration, the extent of non-reporting, the quality of auxiliary information such as socio-demographic information, the characteristics of "temporary migrants," etc., would provide a basis for evaluating the accuracy of derived data and identifying specific sources of error.

2.1.4 Family Allowance Accounts (Health and Welfare Canada)

Population Covered

The population consists of all children eligible for family allowance payments. The file is national in coverage, and lists virtually 100% of children aged one month to 17 years, inclusive. The slight underrepresentation of both infants and older children may necessitate minor adjustments to the data.

Adolescents who are no longer dependants of their parents following marriage or entry into the labour force are no longer eligible for coverage, and consequently are removed from the files. This exclusion primarily affects 16 and 17 years olds; about 3½% of 17 year old children are not listed because of ineligibility.

Certain religious groups, such as some Amish and Hutterite sects, do not participate in the program, resulting in the absence of a small number of children from the file. Unlike the independent adolescent category, these exclusions are not age-biased.

Delay in registering newly-born infants results in an 8% underrepresentation of the 0-1 year cohort on the file. Time-lags in the reporting and recording of migration, both international and interprovincial, represent a comparatively minor source of inaccuracy.

File Structure

The basic unit on the F.A. file is the account. Accounts are in the name of the recipient (i.e., parent), but include information on the number of children per account.

Foster children and children in the custody of social service

agencies represent a special case, since the basic filing unit for these children is the individual child rather than a family account.

The file includes data on the birth date and sex of children. File structure provides a basis for studying family size, although the separate listing of foster children and the exclusion of children over 17 years of age introduce errors. Since children are enrolled shortly after birth, it is probable that age data would be very reliable.

Geographical Breakdown

The F.A. file includes mailing addresses for each account. There are postal codes, so sub-provincial regionalization is feasible.

The usual problems associated with postal codes apply. The mailing address and residential address may differ, and in rural areas commonly refer to different municipalities. Modifications over time in the postal code system and the occurrence of "unknown" postal codes are other problems which need to be dealt with. In a few cases, the address of the child may differ from that of the adult receiving the cheque. Children attending boarding school would be an example.

Methodology Used to Maintain the File

Full documentation on the structure and maintenance of the file is not available. Partial documentation is available in the 1978 report "Documentation on Programme F 55."

Files are assigned to provinces on the following basis: the province of parent's residence for regular domestic accounts; the last province of parent's residence for recipients in foreign countries; and the province of license of the controlling agency for agency and foster children.

Children are added to the file as a result of births and in-migration from other countries. The death of the child, emigration, achieving the age of 18 years, or achieving independence from the parent all result in the removal of a child's name from the file. Account transfers occur as a result of changes in maintenance responsibility for a child. All such changes in coverage become effective one month after the pertinent demographic event.

Inclusion in a particular provincial sub-set or a given month is based on *entitlement*. In other words, retroactive changes are made to correct for slow reporting of changes in address or coverage status. Prior to January 1978, the Master File listed children who had received a family allowance payment in a given month.

The file lists both the effective date of demographic events and the date of administrative action with respect to a registration change.

Unlike most other files, there is a strong positive incentive to ensure that mailing address changes are promptly reported. This is

because of the monthly mailing of family allowance cheques. Hence, it is probable that address information on the family allowance file is more accurate than on other files. The incentive to report address changes applies equally to inter-provincial and intra-provincial migrants.

The movement of children under the care of welfare agencies cannot readily be monitored, however, because the cheque is sent to the agency; unless the child is transferred to the jurisdiction of a different agency, an address change would not be recorded if the child migrated.

The time lag in recording migration is believed to be about 2 to 3 months. Although this is longer than one would wish, it is better than that associated with most alternate data sources.

Accessibility and Documentation

Files for all provinces are generated twice a year, i.e., in June and December. These files generally become available 2-3 months after the reference dates.

The file specifies the effective date of adjustments to accounts. Consequently, it is possible to specify on other than semi-annual time frame (e.g., monthly).

The file is maintained by Health and Welfare Canada. It is also available from A.N.S.S.I.R. and provincial special services ministries.

Accessibility of family allowance data has been very good for a number of years. In fact, the development of methodology to estimate migration from family allowance data has been actively encouraged. However, the ground rules concerning what information can be obtained and, ultimately, access to the data remain the prerogative of the federal government.

Present Uses of the File

The primary purpose of the file is to maintain a record of all persons entitled to receive family allowance payments, together with basic demographic information concerning the children registered in each account.

Data on inter-provincial migration of children eligible for family allowance payments are used by Statistics Canada and various provincial ministries interested in population change for the estimation of migration. Generally, multipliers are used to convert family allowance figures on child migration to estimates of total numbers of migrants.

Development work is currently in progress on procedures to generate sub-provincial data from the family allowance files. These programmes will produce data according to regionalization specifications supplied by the user and derived from postal codes. One program (F 55) generates statistics on children entitled to family allowances,

while the other (F 59) is designed to provide sub-provincial migration data.

Overall Assessment as a Source of Migration Data

(a) Strengths

The file has a number of particularly significant strengths:

(i) There is virtually 100% coverage of the 0-17 year-old population.
(ii) There are strong positive incentives for people to report changes of address promptly. Consequently, the lag time for reporting migration is relatively low (2-3 months), and the completeness of reporting very high.
(iii) As a federally-administered file, its form, accessibility and standards of maintainance are uniform for all provinces.
(iv) Inter-provincial migration data from the file are readily available, and more complex programs are being developed to generate sub-provincial migration statistics.
(v) Knowledge about the characteristics of migration data derived from the family allowance file is far more advanced than is knowledge about migration estimates derived from other files.
(vi) There are excellent possibilities for longitudinal studies of migration using successive generations of the family allowance master file.

(b) Weaknesses

Although the family allowance file gives virtually 100% coverage to children aged 0-17, the remaining 70% of Canada's population is not listed. Moreover, the excluded (adult) cohorts account for the economically significant portion of the population, as well as all persons who are the decision-makers in the migration process.

Since single adults who are not parents are not even indirectly represented on the file, it is necessary to assume that their migration patterns vary in direct relationship to those of adults with children. This is not necessarily a valid assumption, particularly if monthly, quarterly or semi-annual estimates are wanted. Adults having no children are more readily mobile, since the educational needs of children and the preference for moving during school holidays do not affect the decision to move. This problem may be alleviated if adjustment factors are calculated frequently (e.g., quarterly) using a file which gives essentially complete coverage of the population. The medicare files are the most promising source for these adjustment factors.

Successive generations of the family allowance file are produced semi-annually. Although this does not preclude the possibility of making quarterly migration estimates, quarterly file updates would be preferable.

The family allowance file already provides an excellent index of inter-provincial migration activity, as well as immigration to Canada. It is potentially extremely useful for intra-provincial migration. However, it is less accurate as a measure of emigration. Because a monthly payment is involved, emigrants have a disincentive for prompt reporting of address changes, and may be able to collect family allowance for some time after leaving if friends or relatives forward the cheques to them.

The monthly tabulations provided by Health and Welfare Canada refer to the number of address changes *processed* during the month rather than the number *occurring* during the month. This is a significant source of error, since there is generally a time lag of 2 or 3 months between the move and the time of administrative action.

(c) General Assessment

The family allowance file has been, and is very likely to remain, a very significant source of data on inter-provincial migration.

The most significant strength of the file is its virtually universal coverage of a well-defined cohort, i.e., the 0-17 year old population. Unfortunately, adult migration must be estimated using multiplication factors. This is an inevitable source of error, although one which would be rendered less potent if a more sophisticated system of multipliers were developed.

A second strength of the family allowance file is the relatively prompt reporting of migration, in most cases. The positive incentive associated with monthly payments ensures that most registrants promptly and voluntarily report address changes.

There have been several years of experience in using family allowance data for intra-provincial migration estimation. The on-going development of a program for deriving sub-provincial migration estimates promises to provide much more comprehensive data on migration patterns. Since the sub-provincial migration program will deal exclusively with children, the ultimate value will depend on the development of multipliers which accurately reflect the child/adult ratios in migration streams, and which can be adjusted over time as the composition of the migrant population changes. The present system of using the census as a basis for calculating multipliers is relatively inflexible since multipliers can be calculated only every five years. Health care and income tax files have excellent potential for providing multipliers which are less crude than those presently used.

There is always the possibility that family allowance payments could cease to be universal as a result of government legislation. For example, coverage might be limited to the lower- and middle-income sectors of the population. If this file ceased to be universal, its utility as

a migration data source would be very severely limited. For this reason, alternate sources of migration data should also be developed.

2.1.5 Income Tax Files (Revenue Canada)

Population Covered

The file lists all persons who filed a Canadian income tax return during a given year, together with their dependants. Approximately 80% of the adult population of Canada file income tax returns. Over 90% of the total population is accounted for on the file, either as filers of tax returns or as dependants.

No data are available on the characteristics of the non-filing population. It is probable that this group differs significantly from the general population in a number of characteristics. For example, the non-filers would include a disproportionate number of poor people, the old, foreign students not eligible for employment in Canada, and, probably, native Canadians and women.

The more important consideration for our (i.e., demographic) purposes is whether the migration patterns of the excluded group differ significantly from those of the general population. There is no existing basis for judging this issue. It would be necessary to assume that there is no significant difference between the tax-filing population and the total adult population if the income tax file were to be used to monitor migration.

File Structure

The income tax files are completely computerized.

Records are maintained for individual tax filers, with their dependants being listed on the file. It is generally impossible to study family units using tax data, since many wives and income-earning children file separate returns from the head of household.

The social insurance number provides a means of file matching, i.e., tracing individuals in successive generations of the income tax file.

The income tax file contains excellent data on income and occupation as well as basic demographic data (date of birth and sex) of individuals filing returns and their dependants.

Geographical Breakdown

Each tax return lists the province of residence as of December 31 of the previous year. A current postal address and the address used on the previous year's return, if different from the current one, are also listed.

The postal code component of filers' addresses may be used for the geographical assignment of returns. Postal codes were absent from about 10% of the 1979 tax returns.

The problem of missing postal codes in the income tax file is largely overcome by the inclusion of a separate locality code in the computerized tax records. This five digit code includes a census division component and a component to identify the municipality. It is devised using the postal address on each return. This locality code may be used to provide a consistency check on postal codes and as an alternative to the postal code for geocoding purposes.

The income tax files suffer from all the usual problems associated with locationally nonspecific postal codes for rural routes, post office boxes and suburban delivery boxes. In addition, some addresses listed on tax returns are misleading since the address of an accountant's office or another business address may be used in place of the filer's residential address. Downtown areas of larger cities, where most of these offices are found, are particularly affected. For example an experimental study by Statistics Canada in Calgary showed that one central census tract had a coverage ratio of 158% (158 personal returns per 100 residents), compared to a mean ratio of 52% for the city.

Methodology Used to Maintain the File

The sort of constant updating to correct addresses, registration status, etc. which occurs with other government files such as family allowance or health care is not particularly significant with the income tax file. Each year's returns are essentially discrete from previous returns filed by the same person, although the social insurance number provides a means to trace an individual's returns over time.

The great majority of persons liable for taxation file returns each year. The increasingly sophisticated computerization of the system provides a means of identifying those guilty of tax evasion.

All but about 2% of returns are filed during the first four months of each year. The remainder are submitted at any time following the April 30 filing deadline. These late returns represent a fairly minor source of difficulty for migration estimation using the tax file.

Accessibility and Documentation

The income tax files are maintained by Revenue Canada. Statistical analysis of the file for demographic purposes is conducted by Statistics Canada. Other users of demographic data must make their requests through Statistics Canada. Although accessibility regulations remain undecided at the present time, there is unlikely to be any problem with regard to the accessibility of aggregate demographic data.

Statistics Canada is presently developing the capability to analyze migration patterns at a sub-provincial scale using the income tax files. Trial printouts for the period 1971-76 have been produced. It is expected that the program will be operational by mid-1981. Documentation on the program is still very sparse, but that should soon change.

In addition to the full listing of all income tax filers in each year, there is a longitudinal file consisting of a 10% sample of filers who are traced over time from 1967 to date. This longitudinal file contains detailed data on income, occupation, dependants and address, thus providing a basis for studying migration behaviour over time in relation to these individual characteristics and macro-economic conditions.

The time lag in making data accessible is necessarily considerable. Generally, the time lag is 6-8 months following the filing deadline, or 10-12 months after December 31 when the taxation year ends. However, migration episodes studied from the income tax file may have taken place up to 12 months earlier. For example, if a person migrated in May 1979, this change of address would be made in the following year's return, i.e., March-April 1980, and would not be computerized and available for demographic analysis until late in 1980, over 18 months after the actual move.

Present Uses of the File

Revenue Canada maintains records of income tax returns filed each year for the purpose of tax assessment and for associated administrative needs.

Statistics Canada is currently putting considerable effort into developing the income tax file as a major source of demographic and income data, including that for small geographical areas. As part of this program, efforts are being made to develop a procedure to estimate migration from tax data. The use of tax records to generate social data is not new, but current experimental work and other procedures still at the conceptual stage far exceed anything previously attempted.

Overall Assessment as a Source of Migration Data

(a) Strengths

The income tax files have a number of significant advantages for the study of migration. One such advantage is the detailed information on income and occupation which is generally unavailable on other major government files. The income tax file also has basic demographic and geographical information necessary for the study of migration. As a federally-maintained file, it is not subject to provincial variations in regulations and accuracy.

Income tax data are available for several years, making this file much more suitable for longitudinal analysis than other files. There is an existing 13 year longitudinal file containing data on a 10% sample of the population. Social insurance numbers make it possible to conduct larger-scale longitudinal studies.

The income tax file covers approximately 90% of the population.

Only the provincial health care files provide a higher level of coverage. Moreover, the income tax file is virtually complete for the economically-active population who constitute the sub-population likely to be of greatest interest for planning purposes.

Another strength is the fact that sub-provincial migration estimation procedures based on the file will soon be operational.

(b) Weaknesses

The time lag associated with the income tax file is considerable. It is therefore not very appropriate for *current* migration estimates. These are better derived from family allowance or health care files, with the income tax file providing additional data retrospectively a year or so later.

The tax file is generated at yearly intervals. This means that short duration moves occurring within a particular year are not recorded. Thus, the tax file can provide a means of assessing the ***net impact*** of migration at yearly intervals, but cannot provide data on the total volume of migration or the temporal spacing of migration incidents.

It is not possible to analyze family units using tax data, since it is common for a husband, wife and income-earning children from a single household to file separate income tax returns.

Although the total coverage of the population is quite high at about 90%, the excluded group differs significantly from the total population in respect of various socio-economic variables. The excluded 10% may well exhibit atypical migration behaviour as well. It is not presently possible to measure the significance of this problem.

Because each annual version of the file is discrete, it can be assumed that address information is accurate for the filing date. This statement precludes errors arising because of some discrepancies between postal and residential address.

Inclusion of a locality code for each income tax return on the computerized records provides a means of geocoding returns lacking a valid postal code.

(c) General Assessment

Within a year or two the income tax files promise to be a very significant source of the following types of data:

(i) The economic characteristics of migrants compared to non-migrants at the places of origin and destination.
(ii) Individual migration behaviour in relation to income as well as occupation and demographic characteristics.
(iii) Longitudinal data on the impact of migration at the sub-provincial level. New programs based on provincial administrative files are unlikely to provide more than one or two years of data. The analysis of migration patterns using income tax

data can be extended back ten years or more. This makes it possible to match annual migration figures from income tax to the 1971, 1976 and eventually the 1981 census.

(iv) Trends over time in the characteristics of migrants (e.g., age, occupation, income levels).

Income tax files will never be a satisfactory source of current migration levels (e.g., during the previous 6 months), of the total volume of migration, or of the temporal spacing of migration during the year. Other files must be used to generate such data.

Unfortunately, the relatively long time lag associated with the release of income tax data means that it cannot readily be merged with other files having a shorter time lag. For example, it would be less appropriate than health care data as a source of up-to-date multipliers for estimating migration from family allowance transfers. This does not preclude such a use — multipliers based on income tax data would certainly be preferable to those derived from the census which are presently used and which may be as much as seven years out of date.

2.2 FILES WITH LIMITED POTENTIAL

2.2.1 Drivers' Licenses

Each province maintains a file listing persons licensed to operate a motor vehicle. This consists of the majority of the population aged 16 and over. However, the following table comparing Statscan population estimates for Manitoba with Manitoba's licensed drivers shows that there are significant variations in coverage by age and sex. Whereas 85% of Manitoba adult men are licensed to drive, only 62% of adult women have licenses. Among middle aged and older people, the proportion of the population covered in the drivers' license file decreases with age.

Age	Male			Female		
	Licenses (1,000)	Statscan (1,000)	%	Licenses (1,000)	Statscan (1,000)	%
16-24	72.7	90.0	80.8	63.3	88.0	71.9
25-34	73.8	80.0	92.3	64.5	78.9	81.7
35-44	50.5	54.0	93.5	40.5	53.1	76.3
45-54	45.9	51.0	90.0	32.9	52.6	62.5
55-64	40.2	46.4	86.6	25.3	50.6	50.0
65-74	24.8	31.9	77.7	10.9	36.8	29.6
75-84	7.4	14.3	51.7	1.8	19.2	9.4
85+	0.5	4.1	12.2	0.05	6.6	0.8
TOTAL	315.8	371.7	85.0	239.3	385.8	62.0

The proportion of the population covered in the drivers' license files also varies by province. For example, 83% of Saskatchewan's adult population is licensed, compared to 73% in Manitoba. It is probable that coverage is biased in other ways. The poor, comparatively recent immigrants, Indians and residents of remote communities in the North are examples of groups likely to have below-average rates of license possession.

The drivers' license files are computerized and contain mailing address information in the form of postal codes. However, socio-demographic information other than age and sex of the license holder are absent. There are no data on dependants or family structure.

Registrants are required by law to report address changes. However, a substantial proportion of license holders do not send notification of their new address. This particularly applies to intra-provincial migrants.

Where renewal of licenses takes place annually, as in Saskatchewan, many of these migrants may be identified within a year of moving. However, the license renewal period in Alberta is five years, so it is probable that a significant proportion of the addresses on their master file are obsolete.

Inter-provincial migrants may be identified through the routine exchange of licenses surrendered by drivers moving to another province and registering there. However, regulations concerning the duration of validity of an out-of-province license may vary from one province to another. In Saskatchewan, an out-of-province license normally is valid for 90 days, but requirements for changing licenses vary from a 6 month grace period to a requirement for immediate transfer, depending on the province, the employment status of the person, and the class of license. Moreover, the felt incentive to report changes will vary according to whether the license holder owns and regularly drives a car, and whether driving is involved in his or her employment.

Health care data, which cover virtually 100% of the population, or the family allowance file, which covers virtually every child and for which address information is believed to be relatively accurate, or income tax returns, which give far superior data on the demographic characteristics of individuals and families and their income status, are all clearly superior to the drivers' license file as a source of migration data. Barring unforeseen problems with these other sources, the drivers' license file may be eliminated from consideration as a major source of migration data. The shortcomings of the data are sufficiently great that it would be impractical to try to upgrade the file to an "acceptable" standard.

There are two potential uses for the driver's license file in popula-

tion studies. Firstly, driver's license transfers from Saskatchewan to Ontario and Quebec could be used as an indicator of the volume of migration to these provinces, in conjunction with health care data on migration to other provinces. Secondly, data on driver's license transfers could be incorporated into a multiple regression model deriving migration estimates from diverse indicators of migration.

2.2.2 Telephone Billing Records

Telephone companies record information concerning persons who migrate. For persons moving from one telephone administrative area to another, whether in the same province or a different province, a forwarding address is obtained for sending the final statement. New applicants for telephone service are asked to report their previous address and telephone number.

In provinces served by several independent telephone companies, the problems of using telephone data would be extremely great. It is unlikely that the storage format of the data retained by different companies would be sufficiently similar to permit the use of a single program to analyze their data. Variations in data quality would be probable. This problem is not as significant in Manitoba, Saskatchewan and Alberta, since provincially-owned telephone companies have monopoly or near-monopoly control in each province.

The telephone administrative network is divided into a number of operational regions (seven in Alberta) and telephone exchanges (over 300 in Alberta). Each operational region maintains its records independently, although work is proceeding in Alberta on a centralized provincial master file. Unfortunately, the operational regions and exchanges do not correspond to other geographical regions such as municipalities or census divisions. Postal code information from telephone subscribers' accounts might be utilized as a basis for regionalization. This procedure would be appropriate only if the incidence of missing postal codes was relatively low.

British Columbia's Central Statistical Bureau has been optimistic about the potential utility of telephone data for migration studies. Some preliminary methodological work has been completed, but the system remains far from being operational. The attractiveness of the file in B.C. is largely a function of problems with that province's health care files, forcing researchers to look to other sources for migration data.

Telephone data have a number of shortcomings which make them far less attractive than health care data for the Prairie provinces. The file lists only telephone accounts. It provides no demographic data on the subscriber, and does not list dependants of the subscriber. There are problems concerning accounts which are disconnected without any

forwarding address being supplied, and where information on the previous address is missing or misleading with regard to migration behaviour. The lack of any single provincial file, and the problem of translating between telephone regions and municipal regions are also significant.

2.2.3 Old Age Security Accounts

Health and Welfare Canada is responsible for the administration of the old age security system, but provincial social services ministries receive data pertaining to the number of recipients and inter-provincial account transfers each month. All Canadian residents aged 65 and over are eligible for old age security. There is an insignificant minority of persons who do not apply for their pension and remain unrecorded on the file.

The old age security files resemble the family allowance files in certain respects. Both provide a virtually complete listing of a particular age cohort. Both systems require current address information to permit mailing of monthly cheques. In each case, the recipient has a very strong positive incentive to report changes of address. Both systems are federally-administered, and both contain basic demographic data.

The old age security file has not received serious consideration as a migration data source. It covers a comparatively small proportion of the total population, i.e., 7% in Alberta, 10% in Saskatchewan and 11% in Manitoba. The over-65 population is of less interest to most planners, since few of them are economically active. Moreover, it is probable that the migration behaviour of the elderly differs significantly from that of the entire population. Factors such as climate, cost of living, medical facilities and location of relatives are important determinants of their migration, while employment prospects are unimportant. Therefore, the migration behaviour of the elderly cannot legitimately be used as an indicator of the migration of the entire population.

The old age security file would provide an ideal data source for studying the migration of the elderly, assuming that permission to use the data could be obtained. In the future, it is possible that methodologies for monitoring migration will have become sufficiently sophisticated that it will be appropriate to consider a disaggregated approach in which old age security data and family allowance data would be combined with some other data source covering the working age cohorts in order to cover the entire population.

2.2.4 Immigration 1000

Immigration 1000, produced quarterly by Canada Employment

and Immigration, provides detailed data on immigrants to Canada. Immigration 1000 is based on the landing records of immigrants arriving in Canada. A full range of demographic and socio-economic information, such as age, sex, marital status, education, languages spoken and occupation, is available. Geographical information includes countries of birth, citizenship and last residence, and place (i.e., city) of intended destination.

Immigration 1000 data have two major shortcomings. They pertain to intended, rather than actual migration behaviour. Secondly, no information is provided on the numbers, characteristics and destinations of emigrants.

2.2.5 Unemployment Insurance Commission Files

Unemployment Insurance files may be eliminated as a potential source of data on the migration behaviour of the general population for several reasons, such as:

(i) People tend to be registered on the file for a comparatively short period of time.
(ii) The unemployed population is not representative of the entire Canadian population in terms of demographic characteristics, income, or mobility. The unemployed have positive incentives to move.
(iii) Access to the file may be restricted, given the political sensitivity of data on the migration of the unemployed. Such restrictions are not definite; British Columbia already has access to much of the information recorded on the Unemployment Insurance files.

For studies focusing specifically on the unemployed and their migration behaviour, it has great *potential* utility. A longitudinal file detailing the claims, occupational and locational histories of a 10% sample of claimants over time is in the process of being developed.

2.2.6 Municipal Censuses

Municipalities are required to submit population figures annually for the purposes of calculating provincial grants. These data may be derived in a variety of ways. In many cases, a door to door census is taken. At present, migration information is not enumerated. However, inclusion of one or two migration questions, such as "What was your address at this time last year?" could provide data on in-migration and local migration. Intra-provincial migration trends could be studied by combining the results from all municipalities.

The major drawback with the use of municipal censuses would be the lack of standardization and "quality control" in different municipalities, plus the use of non-survey methods in some places. Moreover, these census data are normally not computerized; considerable manpower would be needed to analyze the data.

2.2.7 School Enrollment Files

Each provincial government maintains files on students enrolled in its school system. These systems are computerized, and contain basic demographic data on the children.

Most of the children covered by school enrollment files are also listed in the family allowance accounts. Family allowance data are preferable; they are centralized, conform to a standard format and level of accuracy, have a shorter lag-time with regard to migration reporting, and include postal codes which can be used to group observations according to the specifications of the user. As with family allowance data, some system of multipliers would have to be developed to use educational data to study migration in the general population. In short, school enrollment files are not particularly attractive as a migration data source.

3. METHODOLOGIES FOR ESTIMATING MIGRATION FROM ADMINISTRATIVE DATA

There has been no shortage of attempts to develop methodologies for the estimation of inter-provincial and intra-provincial migration flows from administrative data. These attempts date back to 1961, when Kasahara developed a methodology to estimate inter-provincial migration from the family allowance files. The currently-employed family allowance transfers model is, in fact, a more elaborate version of Kasahara's model.

Family allowance migration data has provided Statistics Canada and provincial agencies with their primary source of inter-censal inter-provincial migration data. Attempts to use income tax data as a migration data source have been made for several years. It appears that this goal will be achieved shortly, thanks to current work at Statistics Canada.

Provincial governments have made some attempts to obtain inter-provincial migration data for their own provinces using files under their control. Ontario has used drivers' license transfers for a number of years. Health care data are being investigated as a possible source of migration data in Saskatchewan and Alberta. The non-participation of Ontario and Quebec in the exchange of information about new registrants from other provinces enrolling in their health care plans means that health care files inevitably provide an incomplete migration matrix.

The development of methodologies for estimating intra-provincial migration has lagged behind work on inter-provincial migration. The demand for intra-provincial data has perhaps seemed less urgent than the demand for inter-provincial migration data. Moreover, considerably more complex methodologies are needed in the case of intra-provincial migration. Few administrative files contain specific sub-provincial regional codes. Until the recent development of computer programs to regionalize according to user-specified regions using postal codes, obtaining sub-provincial regionalization was impractical. Even with postal codes, problems remain due to the common discrepancy between postal and residential addresses.

Methodologies for deriving intra-provincial migration are currently being developed using family allowance data (Statistics Cana-

da), income tax data (Statistics Canada), health care data (Alberta and Saskatchewan) and telephone account transfers (British Columbia).

Conditions making the routine derivation of inter-censal migration estimates feasible were achieved for the first time during the 1970s. The major administrative files were computerized, ending the need for manual tabulation of large numbers of forms. Computers have increased greatly in operating capability and efficiency, making it possible to undertake the conceptually-simple but very time-consuming task of processing very large data sets, even when individual file-matching of two generations of an administrative file is necessary. The adoption of the postal code system and development of computerized regionalization procedures for these codes provides a means of routinely deriving data for user-specified regions from the majority of administrative files. Finally, there has been considerable fundamental research on migration methodology and the characteristics of migrants which will serve as a basis for future research.

With the completion of methodologies currently being developed as well as programs still undeveloped, inter-censal migration estimates based on a variety of data sources will be available for the first time. By comparing these estimates and relating them to census data on population change, it will be possible to assess the validity of the various estimates, make necessary methodological adjustments, and perhaps develop multivariate models using data from a number of administrative files as migration indicators. Comparatively accurate migration data for user-specified temporal and spatial frameworks will, for the first time, be available. These data should greatly enhance our understanding of the nature of migration behaviour in Canada.

This chapter is designed to provide a summary of the methodologies used to derive international, inter-provincial and intra-provincial migration estimates using administrative files. The final section briefly describes the potential utility of postal code translator programs, as well as their limitations.

3.1 INTERNATIONAL MIGRATION

Relatively little has been accomplished in the development of methodology for international migration estimation. The main reasons are the smaller numbers of migrants involved compared to inter- and intra-provincial migration streams, and the difficulty of obtaining accurate data on emigration.

Immigration data are available from the Quarterly Immigration Statistics reports and from the Immigration 1000 file, both administered by Immigration Canada. These sources provide detailed demo-

graphic, socio-economic and geographical information about Canada's landed immigrants. Immigration 1000 provides a basis for user-specified analyses of immigration patterns at the provincial and even the sub-provincial scale.

Intended, rather than actual, destinations are listed in the Immigration 1000 file. It is probable that a significant proportion of immigrants settle in a different locality either immediately or shortly after reaching their stated destination, once better information on employment opportunities is available to them. A survey to ascertain the place of residence of a sample of immigrants perhaps one month and one year after arrival would be useful to assess the geographical impact of immigration.

Immigration 1000 data refer to gross immigration, and emigration is not considered. Emigration estimates are derived by Statistics Canada using U.S.A. and United Kingdom data as indicators of emigration levels. The procedures followed are described in Bulletin 91-208, *International and Inter-provincial Migration in Canada*. U.S.A. immigration statistics and the International Passenger Survey of travellers to the United Kingdom provide estimates for the two main destinations of Canadian emigrants. The total number of emigrants bound for other countries is estimated from census data using a residual method. These gross migration figures are then divided proportionally to derive estimates of the province of origin of emigrants. Such convoluted and rough procedures are necessary because emigrants are not obliged to file any report upon departure from Canada. Needless to say, these estimates are highly contentious — better than nothing, but not much better!

Family allowance and health care files provide alternate sources for international migration data. They have three advantages:

(a) Possibilities for monitoring emigration.
(b) Recording of actual rather than intended place of destination.
(c) Time lags in adding immigrants to the health care and family allowance files are relatively short — under 2 months in most cases.

One advantage of health care data relative to family allowance is its registration of the entire immigrant population and maintenance of information according to family units, whereas family allowance data refer only to children. Immigrants become eligible for health care insurance from the beginning of the month following their arrival in the province of destination. It is reasonable to assume that virtually all immigrants register promptly. Emigrants, however, have no incentive to report their departure to health care commissions. If an emigrant expects to return after some time, he will probably try to retain a valid

registration. There is no means of tracing emigrants comparable to the inter-provincial cooperation in identifying people moving from province to province.

Immigration data for Alberta are currently generated from the AHCIP Master File each quarter. For each census division, the monthly number of immigrants is given according to their countries or global regions of origin.

3.2 INTER-PROVINCIAL MIGRATION

3.2.1 Family Allowance

A detailed description of the family allowance methodology is contained in a paper by Kelly, entitled "Estimation Methodology for Postcensal Interprovincial Migration Estimates." Lalu's *Monitoring Population Changes in the Postcensal Years*, Sangadasa's "Interprovincial net migration estimates using family allowance data: a note on methodology," and the Statistics Canada publication *International and Interprovincial Migration in Canada* (Catalogue 91-208) all contain considerable information on the family allowance methodology. Statistics Canada calculates the monthly flow of out-migrants from each province, by province of destination. The procedure used is outlined below:

$$\text{Adults: } M^{a}_{(j,k)} = \frac{M^{e}_{(j,k)}}{P^{e}_{j}} \cdot F_j \cdot P^{a}_{j}$$

$$\text{Total (1 migration stream): } M_{(j,k)} = M^{e}_{(j,k)} + M^{a}_{(j,k)}$$

$$\text{Total out-migration from 1 province: } M^{t}_{j} = \sum_{k} M^{t}_{(j,k)}$$

Where

(i) $M^{e}_{(j,k)}$ = number of children migrating from province j to province k, according to family allowance records.

(ii) $M^{a}_{(j,k)}$ = number of adults going from j to k.

(iii) $M^{t}_{(j,k)}$ = total number of migrants from j to k.

(iv) M^{t}_{j} = total out-migrants from j.

(v) F_j = adjustment factor for province j. (Ratio of adult out-migrants to child out-migrants).

(vi) P^{e}_{j} = number of children eligible for family allowance in j.

(vii) P^{a}_{j} = adult population (18 years and over) in j.

The adjustment factors (Fj) have been calculated from the 1976 Census as follows:

Newfoundland	1.2773
Prince Edward Island	1.2402
Nova Scotia	1.0453
New Brunswick	1.0831
Quebec	1.1045
Ontario	1.0024
Manitoba	1.0425
Saskatchewan	1.0494
Alberta	1.1078
British Columbia	0.9166
Yukon	1.2108
Northwest Territories	1.8753
Canada	1.0281

Kasahara's original model for calculating net inter-provincial migration used a single adjustment factor, empirically estimated to be 1.1, for all provinces. As the above table shows, this was a very unrealistic assumption, since there are significant differences in the multipliers of the various provinces. Although the current model represents a significant improvement, there are still contentious assumptions.

(i) It is assumed that the same adjustment factor applies to each province of destination from any one province. This assumption seems unrealistic, since it assumes no difference in migration streams according to distance (e.g. Nova Scotia to New Brunswick, versus Nova Scotia to Saskatchewan), or by varying economic conditions (e.g., Nova Scotia to Manitoba, versus Nova Scotia to Alberta).

(ii) The adjustment factor is estimated every five years, based on census data. Thus, it may be in use as much as 7 or 8 years after its date of calculation. Inaccuracies will result because of changes in economic conditions affecting the composition of out-migrant streams from a province, and because of the aging of the Canadian population. Differences in the volume and composition of migration streams are a significant variable in this aging process.

(iii) It is assumed that the same adjustment factor is applicable throughout the year. In fact, there are seasonal changes in the composition of migrant streams, with a higher proportion of families moving during the summer months during school vacation.

(iv) Complete enumeration of the 0-17 year population is also assumed. This is not a major problem, except for the 0 year and 16-17 year children who are slightly under-represented in the family allowance file. Other minor sources of error arise from the assumptions that there is complete enumeration of

the population in the census, and the assumption that address changes are reported punctually by migrants.

(v) Since the 1976 census did not contain any question about the province of birth, it was necessary to assume that changes in the out-migration ratios of 5-9 year old children from 1966-1971 to 1971-1976 also applied to the 0-4 year cohort. A full description of the procedure and attendant assumptions is contained in the paper by Kelly.

Inter-provincial migration data derived from the examination of family allowance transfers are widely used by provincial government departments interested in migration. For the most part, the Statistics Canada methodology is used unaltered. However, Ontario uses the numbers of children moving inter-provincially, based on family allowance transfers, and adds them to drivers' license transfers to estimate total inter-provincial migration. For a time, Alberta Advanced Education and Manpower used a multiplier of 7.14 to estimate total net migrants from the net transfer of family allowance *accounts*. This multiplier was an empirical estimate based on Sangadasa's work.

Lalu (*Monitoring Population Changes in the Postcensal Years*) suggests a number of changes to the Statistics Canada methodology. Most significantly, he suggests that health care data be used as a source of current data on the age/sex composition of the migrant population. This would permit annual, or even monthly or quarterly, revision of the adjustment factors. Thus, the adjustment factors would be responsive to changes in the composition of migrant streams. Presumably, the elimination of out-of-date adjustment factors derived from the census would improve the accuracy of migration estimates.

Both Lalu and Sangadasa have recommended that in-migration, out-migration and net migration be calculated separately from family allowance data. Sangadasa suggests the calculation of separate adjustment factors for in- and out-migration for a province. This is because the age distributions for in, out and net migration differ significantly from each other. Evidence of this may be seen in the ratios of population 5+ to population 5-14 calculated by Sangadasa. Examples of these ratios for 1971 are:

	Total population	Net migration	Out-migration	In-migration
Calgary	4.29	7.35	3.92	4.69
Edmonton	4.24	8.55	4.06	4.32
Regina	4.46	4.17	4.17	4.17
Winnipeg	5.00	4.39	4.26	4.20

To date, the suggestions made by Lalu and Sangadasa have not been implemented. Use of health care data to furnish multipliers is

hampered by the provincial control of these files, leading to variations in the accuracy of the data and its recoverability.

Health and Welfare Canada is currently developing a computer program known as F 59 to extend its capabilities to monitor migration. The program will provide data at the sub-provincial (e.g., census division or other geographical units specified by the user) level. For inter-provincial as well as international migration, this will permit the analysis of the comparative impact of inter-provincial and international in-migration and out-migration in different parts of a province. Intra-provincial migration is also monitored in the program.

The format of the major inter-provincial migration table is shown on the following page. Separate in-migration and out-migration tables are produced.

Program F 59 relies on postal codes as a means of assigning registrants to geographical units. Two versions of the family allowance master file will be compared, and the differences in the two files analyzed to ascertain whether they are due to migration of a particular type or some other factor (e.g., births, deaths, or termination of eligibility due to age).

The migration output of the program classifies in-migrants to and out-migrants from each specified region according to their regions of origin, destination, age and mean family size (no. of children/no. of families).

The main weakness of the program will be its restriction to only recipients of family allowance, i.e., children aged 0-17. It will remain up to the ultimate user to devise a means of converting these cohort migration data into migration estimates for the entire population. To date, no satisfactory methodology has been developed for this purpose.

The F 59 program is still under development, and is expected to take another year to complete. When it becomes operational, it promises to provide a significant advancement in the development of migration-estimation methodology.

3.2.2 Drivers' Licenses (Ontario)

Ontario uses two sources to obtain migration estimates, namely drivers' license transfers and family allowance transfers.

Inter-provincial migration estimates are compiled by adding the number of drivers' license transfers and the number of family allowance transfers for (i) in-migrants to Ontario, and (ii) out-migrants originating in Ontario.

Data on family allowance transfers are available for each month from Health and Welfare Canada. The Ontario Motor Vehicles Branch maintains a count of applications for Ontario licenses by per-

sons with licenses from other provinces. They also record the transfer of Ontario drivers to other provinces using the Ontario licenses returned each month to Ontario from other provinces.

Although it is claimed that this methodology produces reasonable estimates of migration flows, it has several notable conceptual weaknesses.

(i) Only a portion of the adult population is licensed to drive — roughly 70%, according to the Ontario Demographic Bulletin. Non-coverage varies greatly according to sex (more men drive than women), age (the proportion licensed to drive falls with age from about 40 years up), ethnicity (some recent immigrant groups containing an above-average number of non-drivers) and geographical location. Data on these driver characteristics are unavailable. The partial coverage of the population has not been taken into account in the methodology; no attempt is made to adjust the total number of license transfers to reflect the partial coverage afforded by the file.

(ii) The two files overlap with respect to the coverage of 16 and 17 year-olds. It is assumed that this overlap partially compensates for the absence of non-drivers from the drivers' license files. However, this implies the rather large assumption that teenage migration patterns are similar to those of the non-driving population — primarily female and over 45. Additionally, there is a considerable numerical disparity between the total number of 16 and 17 year old drivers and the total number of non-drivers.

(iii) Licensing regulations concerning the registration of newly-arrived in-migrants to other provinces vary greatly. In many provinces, the transfer must take place within 3 months, but for example, there is a 6 month grace period in British Columbia. These differing regulations result in varying time lags for reporting migration depending on the province of destination. They also affect the reporting of short-term migration, since a license transfer may be necessary in one province but not in another. Varying time lags may also result from variations in efficiency in the different provincial licensing offices.

(iv) Drivers who migrate inter-provincially have no particular incentive to obtain a new license until the expiry date of the license from their former province of residence if they do not own a car or drive in connection with their work.

Ontario has occasionally produced an intra-provincial migration matrix showing drivers' license transfers by county. Although these data may provide a rough indication of major migration streams within the province, they refer only to the proportion of the adult population who drive. Intra-provincial family allowance transfer data are still unavailable. In addition, it is probable that an even higher proportion of intra-provincial than inter-provincial migrants are slow to report address changes.

3.2.3 Health Care (Alberta)

Alberta Health Care Insurance Plan produces monthly summary tables pertaining to in-migration to Alberta from other provinces and outside Canada. These data are derived from the Alberta H.C.I.P. Master File, and pertain to new migrants registered on the system. Out-migration from Alberta is not covered. Tables are produced both for the months of residency in Alberta and the effective registration month.

The following tables are produced by the program:

(a) Provinces and countries of origin of inter-provincial and international in-migrants, by census division;

(b) Age distribution of in-migrants to Alberta, (i) by month of residency, and (ii) by census division.

(c) Sex and family status (single or family) of in-migrants to Alberta.

The program has been operational since 1976. Thus, five years (1976-81) of data are available, although data for the first several months are partial and unreliable.

Because late registration is a very common phenomenon among in-migrants, the figures tend to change significantly in each of several months following their initial publication. Thus, recent data must be treated with extreme caution.

The fact that data are produced for sub-provincial units, i.e., census divisions, is a noteworthy feature of the program. However, the utility of the data is lessened by the lack of out-migration information, the problem of significant retroactive adjustments which make current data rather unreliable, and the unsatisfactory format of some tables. For example, in certain tables data from 1976 to date are aggregated, making it relatively difficult to obtain monthly or annual estimates.

Alberta Bureau of Statistics is conducting a pilot project using AHCIP data to generate "mobility" statistics, only for Fort McMurray to date. Due to AHCIP's current file maintenance procedures, it is impossible to distinguish between the various categories of migrants to the town, or even between additions to the MRF resulting from migration and those having other causes. Likewise, deletions from the file resulting from deaths and registration status changes (e.g., due to marriage) cannot be distinguished from deletions associated with out-migration.

Using postal codes to define the area, two generations of the file are compared in order to identify households listed only on the earlier version, and those included on both.

ABS is somewhat ambivalent about the procedure, at once referring to the figures generated as counts of "in-migration" and "out-migration," and admitting that "AHCIP-based mobility data do not reflect migration, but rather changing household registration only ...."

FEB 13, 1981
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ALBERTA HEALTH CARE INSURANCE PLAN
DISTRIBUTION BY PLACE OF ORIGIN
BY EFFECTIVE REGISTRATION MONTH

YEAR 1980 FEBRUARY

Origin Title	Single Male	Single Female	Family Total	Registration Count	Male Total	Female Total	Grand Total
Newfoundland	65	34	91	129	115	75	190
Nova Scotia	130	65	181	256	225	151	376
P.E.I.	34	12	21	55	45	22	67
New Brunswick	108	55	145	217	177	131	308
Quebec	233	98	470	479	459	342	801
Ontario	890	422	1,725	1,885	1,751	1,286	3,037
Manitoba	232	109	529	516	499	371	870
Saskatchewan	234	130	472	519	455	381	836
British Columbia	422	270	788	961	803	677	1,480
N.W.T. and Yukon	30	13	83	75	75	51	126
	2,378	1,208	4,505	5,092	4,604	3,487	8,091
U.S.A.	24	15	79	60	68	50	118
Cen. & S. America	8	5	16	19	16	13	29
U.K. and Ireland	19	25	147	92	93	98	191
Portugal	1	2	9	6	3	9	12
Other Europe	25	22	58	67	50	55	105
Asia	64	47	261	186	199	173	372
Australia	4	2	12	10	8	10	18
Africa	4	2	19	12	12	13	25
Unknown	4	2	6	9	7	5	12
	153	122	607	461	456	426	882
	2,531	1,330	5,112	5,553	5,060	3,913	8,973

FEB 13, 1981
MDCS2131

ALBERTA HEALTH CARE INSURANCE PLAN
DISTRIBUTION BY AGE GROUP WITHIN CENSUS DIVISION
WITHIN MONTH OF RESIDENCY

YEAR 1980 FEBRUARY

Age Group	Single Male	Single Female	Family Total	Registration Count	Male Total	Female Total	Grand Total
CENSUS DIV. = 06							
Under 1	9	6	45	29	32	28	60
01 - 04			204	69	114	90	204
05 - 14	1	2	334	73	166	171	337
15 - 24	692	419	451	1,278	880	682	1,562
25 - 44	371	118	684	732	729	444	1,173
45 - 64	31	32	99	107	87	75	162
65 and over	6	20	20	35	16	30	46
	1,110	597	1,837	2,323	2,024	1,520	3,544

Extract from AHCIP printouts on in-migrants to Alberta.

3.2.4 Health Care (Saskatchewan)

Saskatchewan Bureau of Statistics is currently developing methodology to generate migration data for sub-provincial areas. It will produce estimates of both inter-provincial and intra-provincial migration.

Persons moving inter-provincially are assigned to one of the following categories:

(i) In-migrant with no previous SHSP record.
(ii) In-migrant reactivating an old record (i.e., former resident of Saskatchewan).
(iii) Temporarily absent Saskatchewan resident returning to province.
(iv) Temporary in-migrant.
(v) Social Assistance recipient migrating to Saskatchewan.
(vi) Addition of a beneficiary from outside province to an existing record.
(vii) Out-migrant (temporarily absent).
(viii) Out-migrant (long term).
(ix) Out-migrant (unknown).

Migrants are identified by matching two versions of the Master Registration File, with particular reference to two data fields showing a "move" code and a "beneficiary status" code.

3.2.5 Health Care (Statistics Canada)

The Demography Division of Statistics Canada has begun to produce semi-annual tables of in-migration, out-migration and net inter-provincial migration for each province. These data are based on health care data which are sent to the Demography Division by participating provinces. With the exception of Ontario and Quebec, all provinces send notifications of new registrants originating in other provinces. By combining these data, it is possible to produce an inter-provincial migration matrix.

Unfortunately, the lack of data on migration to Ontario and Quebec means that a very large component of inter-provincial migration cannot be measured. Another deficiency is related to differences in the punctuality of administrative action between provincial health care authorities, and differences in the incidence of non-reporting and late reporting of inter-provincial moves by migrants. Varying provincial regulations concerning fees and registration regulations are major contributory factors.

3.2.6 Income Tax Filers' Migration Program

Attempts to monitor migration using income tax data are not new. Experiments with such a methodology were made in the early

1970s, but were abandoned due to the insufficient reliability of the estimates obtained.

D. Norris and associates in the Administrative Data Development Division of Statistics Canada are currently in the data evaluation stage of a project to develop a methodology to monitor inter-provincial and intra-provincial migration using income tax files. Data for the years 1971-72 to 1975-76 have been generated. Currently, data are being generated for more recent years.

The methodology uses postal codes to establish the geographical location of each filer. The tax form asks for the address used on the previous tax return, as well as the current address. A separate locational code is available for each return; this code serves as a back-up system for use when the postal code is absent. Family size and characteristics may be studied using the tax exemption information on returns. There is also a correction to account for under-coverage; some 5-10% of the population is neither a tax filer nor a registered dependant. Late filing of returns following the usual April 30 deadline also accounts for a partial under-count in current files.

The program generates the following tables to migration data:

(a) Total in-migration from other census divisions, by age, sex and census division.
(b) Total out-migration from other census divisions, by age, sex and census division.
(c) In-migration by province of origin, census divisions.
(d) Out-migration by province of destination, census divisions.
(e) Intra-provincial in-migration by census division of origin.
(f) Intra-provincial out-migration by census division of destination.

At present, the time lag is roughly 18 months, but it is anticipated that this may be reduced to about six months. The time lag is actually much greater, since tax returns filed in April and analyzed six months later include the first records of migrations which had occurred early in the previous year. Thus, the income tax program is not suitable for generating very current estimates of migration. It is also incapable of identifying more than one migration episode per filer per year.

The most important attribute of the tax filer's data is the considerable detail it contains on economic, occupational, and demographic characteristics.

A longitudinal file containing the annual tax records of a 10% cross-section of the Canadian population has been developed for the period 1967 to the present. This provides data on migration patterns over time (e.g., return migration) and migration behavior in relation to family size, income, employment status, etc. The development of programs to analyze these data is still at a preliminary stage.

Assessment of Preliminary Results of Income Tax Filers' Migration Program for Alberta

In late 1980, tables were produced showing the patterns of in-migration and out-migration for Alberta census divisions for the period 1971 to 1976, derived from income tax filers' data. This section provides a brief analysis of net migration volumes over this five year period. Net migration values were obtained as the difference between in-migration (Table 1 of tax filers' data) and out-migration (Table 2) for each census division.

The tax filers' data are compared to census data for 1971 and 1976, and to estimates of the components of population change for the 1971-76 period from *Revised Annual Estimates of Population for Census Divisions, 1971-1976* (Catalogue 91-521). Unfortunately, these data are subject to certain significant sources of error. Firstly, there are problems of under-counting in the census, commonly amounting to 2-3% of the population. Secondly, natural increase for each year for each census division is rounded to the nearest 100. Thus, the given annual figures are accurate to only ± 50 people, or up to ± 250 cumulated over five years. Thirdly, migration is not measured directly, and can be estimated only as the residual population change additional to natural increase.

Table 3.1 summarizes the data relevant for this comparison. Net migration rates for the two sources are calculated, i.e., net migration as a percentage of the 1976 population.

Migration estimates based on the two sources vary greatly in their degree of correspondence. Those for C.D.s 13, 14 and 15 correspond closely. Those for C.D.s 1, 2, 5 and 8 are also reasonably similar to each other. At the other end of the scale, estimates for C.D.s 3, 10 and 12 not only differ greatly in the estimated *volume* of migration, but also the *direction* of net population change as a result of migration. For example, the Statscan residual for C.D. 12 is + 4,000 people, while the income tax figure is -2,400 people. As a net rate, Statscan shows a gain of 6.3% due to migration between 1971 and 1976, while income tax indicates a 3.8% loss. The remaining census divisions also have a relatively poor correspondence between Statscan and income tax estimates for migration. For C.D. 6 (Calgary area) and C.D. 11 (Edmonton area), the income tax file estimated approximately 20,000 less net migrants in each case than the residual method. The estimated net migration to C.D. 11 according to the income tax file was only 46% as high as the number calculated by the residual method.

In short, the income tax filers' migration program does not appear to provide accurate data on the volume and direction of migration. In the majority of census divisions, there are significant discrepancies between census-based and tax-based estimates. Moreover, in three

TABLE 3.1

COMPARISON OF INCOME TAX MIGRATION ESTIMATES FOR ALBERTA
AND STATISTICS CANADA MIGRATION ESTIMATES BASED ON THE RESIDUAL METHOD, 1971-76

Census Division	1971 Census	1976 Census	Natural Increase	Residual	Net Migration (Income Tax)	Net Migration Rates (%) Census (Residual)	Income Tax
1	39,200	47,000	1,400	6,400	5,200	13.6	11.1
2	86,600	97,000	4,600	5,800	4,800	6.0	5.0
3	30,900	32,900	1,200	800	-1,200	2.4	-3.7
4	13,000	12,100	500	-1,400	- 900	-11.6	-6.7
5	34,500	35,400	1,300	- 400	- 900	- 1.1	-2.5
6	447,100	524,600	26,600	50,900	30,200	9.7	5.8
7	38,300	37,800	1,500	-2,000	- 650	- 5.3	- 1.7
8	85,600	94,000	4,000	4,400	3,700	4.9	3.9
9	19,800	21,300	1,000	500	2,500	2.4	11.7
10	65,500	67,200	1,800	- 100	4,100	- 0.1	6.1
11	552,500	630,900	36,100	42,300	19,600	6.7	3.3
12	54,600	63,100	4,500	4,000	-2,400	6.3	- 3.8
13	43,800	45,000	1,100	100	400	0.2	0.9
14	21,700	24,800	1,700	1,400	1,650	5.7	7.1
15	94,800	105,000	8,800	1,400	1,500	1.3	1.4

Sources: Preliminary printouts for Alberta, 1971-76, income tax filers' migration program. Revised Annual Estimates of Population for Census Divisions, 1971-76 (Cat. 91-521).
Calculations by the author.

census divisions, the two sources differ as to whether the division is gaining or losing population as a result of migration. Of the eight C.D.s having relatively poor estimates, six (C.D.s 3, 4, 6, 7, 11 and 12) show lower rates of net population transfer according to income tax than according to the residual method. However, in C.D.s 9 and 10, the income tax estimates of net migration are very significantly higher. The very significant variations in the size and even the direction of apparent errors in the income tax data means that it would be virtually impossible to develop a methodology to compensate for these errors.

A number of sources of error may be suggested to account for problems in the income tax migration data:

(a) There may be significant variations in the extent of non-filing of tax returns in the different census divisions. Where there is a low percentage filing returns, the volume of both in- and out-migration would be under-estimated.
(b) Persons migrating to take a job or attend school prior to first filing a tax return would not be identified as migrants, since there would be no record of their previous addresses.
(c) Persons leaving the country are liable to fail to complete a return unless they are entitled to a refund. This may account for the high estimate of net migration into C.D. 9 (Jasper, Banff), where there is a considerable amount of transient and short-term employment. Whereas persons moving to other parts of Canada could be identified in subsequent tax years if they file a return, tax filers leaving the country and failing subsequently to file a return could not be confirmed to have migrated away.
(d) Migration associated with marriage, where the spouse had not previously filed any tax return, may remain undetected.

No attempt has been made to assess the accuracy of the age/sex data from tax filers' migration data, or the breakdown by province and census division of migrant origins and destinations. It is probable that these *profiles* of the composition of migrant streams are of acceptable accuracy. There may be an under-estimation of young adult migration due to factors (b) and (d) described above.

The greatest potential utility of the tax files lies in the investigation of economic aspects of migration. Unlike other files, detailed data on income and occupation are available. It should be possible to compare the incomes of migrants to those of non-migrants in the regions of origin and destination, and to assess the economic returns to migration by comparing the income performance of migrants in subsequent years to the performance of the general population.

3.3 INTRA-PROVINCIAL MIGRATION

Work on intra-provincial migration methodologies is more recent than that for inter-provincial migration. A major limiting factor

has been the lack of information other than address, including postal codes, on the location of registrants within sub-provincial geographical regions in most government files.

Recent development of a methodology to allocate postal codes to user-defined geographical units has now made it feasible to develop intra-provincial migration methodologies. In most cases, these are the same programs described in the previous section on inter-provincial migration.

3.3.1 Drivers' licenses (Ontario)

In 1975, Ontario created a matrix of inter-county migration from a 3% sample of drivers' license transfers in the province. Ontario drivers' licenses show the municipality of residence. There has been no further development work on this methodology.

3.3.2 Health Care (Manitoba)

Manitoba conducted experimental work on a program to generate intra-provincial migration estimates from their health care data in 1975-76. Preliminary data were produced. However, as the accuracy of the health care file deteriorated, it became impossible to obtain accurate migration estimates from it. At the present time, the program is no longer in use, and has been withdrawn by Manitoba Bureau of Statistics. No details on the program are presently available, except that it relied on a municipal code (i.e., other than postal code) listed on each registrant's file.

3.3.2 Health Care (Saskatchewan)

The methodology described in the inter-provincial migration section based on Saskatchewan's health care file will also produce intra-provincial migration data when it becomes fully operational. Intra-provincial migrants are identified through a comparison of both address and residence (i.e., municipal) codes on two versions of a file. Migrants will show a change of both codes, while local movers will have a new address but the same residential code. Data is also generated on three categories of registration change where intra-provincial migration may or may not be involved. These categories are addition of a beneficiary to a family from within the province (e.g., marriage), creation of a new family record from within the province (e.g., an unwed mother aged 18 or under), and Social Assistance nominees moving within the province.

3.3.4 Family Allowance Program F 59

Family allowance data has been used for many years to generate inter-provincial migration estimates. At the present time, a program

known as F 59 is being developed under the direction of M. Fearon of Health and Welfare Canada to generate sub-provincial migration data using family allowance files. Postal codes and a user-supplied translation program will be utilized to provide data for sub-provincial data units. International and inter-provincial, as well as intra-provincial, data will be generated by the program.

A preliminary description of the program specifications was prepared in July 1979. It is entitled "Final Specifications for a System to Produce Sub-provincial Migration Statistics on Children Entitled to Family Allowances."

The F 59 intra-provincial migration tables are reproduced on the following pages.

The program will produce data on the number of family allowance recipients. It will still be necessary for users to develop a means of estimating total migration flows from this data on child migration.

It is expected that F 59 will not be ready for use for another year or so. When it is, it promises to provide a very comprehensive and reliable source of intra-provincial migration data.

3.3.5 Income Tax filers' migration program

The income tax filers' program described in considerable detail in the inter-provincial section also generates intra-provincial in-migration and out-migration estimates for census divisions. It has not been possible to assess the accuracy of these intra-provincial migration estimates. It can be assumed that the sources of error described in the inter-provincial section apply equally for intra-provincial migration.

PROGRAM F 59

DETAILED TABLE OF CHILDREN IMMIGRATING
INTRAPROVINCIALLY TO A GIVEN AREA

	Age of Children						
Origin	0	1	2	...	17	Total Children	Total Families
Area 1							
Area 2							
Area 3							
.							
.							
.							
Area n							
Total Children							xxxxx

PROGRAM F 59

DETAILED TABLE OF CHILDREN ENTERING FA PROGRAM
OR PROVINCE TO A GIVEN AREA

Reason for Entry	Age of Children 0	1	2	...	17	Total Children	Total Families
Inter-provincial Immigration from:							
NFLD							
PEI							
NS							
.							
.							
.							
NWT							
Total							
International Immigration:							
— Canadians, FA resumed							
— Canadians, FA continued							
— "Visitors"							
— Landed immigrants							
New Births							
Other Reasons							
Total Children							xxxxx

3.3.6 Telephone Transfers (British Columbia)

British Columbia Ministry of Industry and Small Business Development, Central Statistics Bureau has done preliminary work on the development of a methodology using B.C. Tel data on telephone transfers to derive migration estimates. This work has been directed by S. Miller.

Normally, when a telephone is disconnected because the subscriber has moved, a forwarding address is obtained for the purposes of sending the final telephone bill. Thus, phone connections may serve as a source of migration information. However, the use of these data requires the development of conversion factors to account for disconnections where no forwarding address is present, to translate telephone

transfers into equivalent numbers of people, and to obtain data for meaningful geographical units frequently different from telephone districts.

The third problem may be addressed using postal codes and a translator program. The other two require the use of other data sources such as the Census or Family Allowance files.

Some methods have been briefly outlined in a working paper entitled "Three possible methods of using B.C. Tel data to determine migration flows." These are summarized below. In each case telephone disconnections are divided into those pertaining to movement *within* a given telephone free call district and other disconnections, with particular reference to movement to other districts and outside the province. Although the latter categories are ultimately of greater interest in terms of migration, local flows are important for estimating the characteristics of the migrating population.

The population moving within a district may be estimated by multiplying local telephone transfers by the ratio of total population to total telephones and the result by a multiplier reflecting differences between family sizes for the migrating and total populations. This locally mobile population may then be divided by the number of children moving within the district to obtain a migration multiplier (Total Migrants/Child Migrants). It is assumed that this multiplier may then be applied to other migration streams of family allowance recipients originating in that district.

A second possible methodology involves assuming (a) that all or a known proportion of disconnections without a local forwarding address pertain to persons who have moved to another telephone district in British Columbia or elsewhere, and (b) that the proportion of unrecorded addresses is the same for all of these destinations. The ratio 1/proportion with a forwarding address is used as a multiplier to convert the known number of transfers to each destination to an estimate of the total number of moves to that destination. Data on total population movement are derived from a ratio of population to telephones adjusted to account for the mean family size of migrants. These estimates could then be averaged with those derived using family allowance data.

The third approach suggested would involve the calculation of *indices* of movement based, for each migration stream, on the ratio of telephone transfers in a given year to those in a baseline year. It would still be necessary to know the ratio for the baseline year of total migration to telephone transfers.

Telephone transfer data could potentially provide a means of estimating all intra-provincial moves as well as inter-provincial out-

migration. Migration into the province is not readily traced from this source, although the availability of health care data on inter-provincial migration could compensate for this deficiency. The work in British Columbia on this methodology is still at a preliminary stage. It remains to be seen if meaningful data can be derived from telephone transfers. Many of the assumptions which have to be made in order to use the data are far-reaching and rather unrealistic.

3.4 GEOCODING OF ADMINISTRATIVE DATA

On the majority of administrative files, geographical location information is confined to registrants' addresses. The health care master files of Manitoba and Saskatchewan and the income tax filers' data base are exceptions; these files contain a locational code for each registrant which may be used for sub-provincial analysis.

There has been considerable work recently on developing the capability to geocode using the postal code component of addresses. This work has been conducted at Statistics Canada as well as certain provincial statistical bureaus, especially those of British Columbia and Alberta.

In urban areas, most individual postal codes can be matched with a specific block face. Problems arise in rural areas, where a single code commonly refers to a village together with the rural routes based there. It is common for postal and residential addresses to differ in rural areas, since some rural residents collect their mail at a post office box in a nearby town. In urban areas, postal codes are post office boxes and general and suburban delivery services do not identify the specific place of residence of the addressee.

The extent of problems arising from nonspecific postal codes varies with the scale of aggregation. Where larger geographical units such as census divisions are being studied, the majority of ambiguous postal codes will clearly fall within a specific division and therefore constitute no problem. Even where postal code regions overlap census division boundaries, it may be assumed that errors resulting from the misallocation of individual records will largely cancel themselves out or be rendered insignificant by the large total number of cases. However, as the size of geographical area decreases, the likelihood of significant error increases. "Fudging routines" may be used to allocate locationally nonspecific postal codes proportionally or to a "most probable" division. However, the reliability of areal data generated from postal code information for such smaller aggregations as municipalities, census tracts, school divisions and hospital catchments remains very suspect.

Postal code translator systems must be continuously updated. For example, new codes are created to designate new residential development projects.

The non-recording or incorrect recording of postal codes on administrative files is a major problem. For example, postal codes are absent on about one-tenth of income tax returns. It is possible to manually code most of these cases using post-office manuals, but this process is very time-consuming. Statistics Canada is developing a program which matches a street address to the corresponding postal code. When fully operational, this program will improve the acceptability of data from administrative files by eliminating most of the "unknown region" cases, as well as reducing the cost and time needed by file administrators to manually process records lacking a postal code.

Postal code translator systems represent a key component in the developing methodology to obtain comprehensive, current migration data from administrative files. The translators may be readily applied to any set of data containing postal address information. They may be made highly flexible with regard to output. For example, British Columbia's translation master file may be used to assign each postal code in the province to the relevant street and community, economic region, census division, census subdivision, census tract, electoral district, enumeration area, school district, school catchment area, human resource district, R.C.M.P. subdivision, R.C.M.P. detachment and health district.

Statistics Canada is working on a translator system called GEOPOST to permit the linkage of postal codes to geographical coordinates. When implemented, this will provide the ultimate level of user-oriented accessibility, since data may be routinely recovered from a file for any area simply by giving its boundary coordinates. Geocoding in terms of geographical coordinates will also permit easy linkage with a wide variety of existing routines for spatial analysis and computer mapping.

4. PROPOSED METHODOLOGY FOR ESTIMATING MIGRATION USING FAMILY ALLOWANCE AND HEALTH CARE FILES

(a) Files to be Used

The proposed methodology employs both family allowance and health care data. The family allowance data will be generated by Program F 59, the program described in the previous chapter which will detail the migration patterns of children entitled to family allowance payments. Data will be generated for user-specified sub-provincial areas. The provincial health care files will be used to develop multipliers permitting the estimation of total migration volumes based on the family allowance data. The health care files of Manitoba, Saskatchewan and Alberta provide virtually complete coverage of their populations, and so may be used for age profiles of the migrating population.

(b) Systems Changes Required

Minor systems changes would be required in the coding of data maintained in the MRFs of Saskatchewan and Alberta. The present system of flagging out-migrants' files merely as "left the province" restricts the utility of these files for monitoring out-migration. The present out-migrant indicator should be elaborated to show province or country of destination (e.g., A = Newfoundland, B = P.E.I., M = U.S.A., etc.) for people leaving the province. This change would not be necessary in Manitoba, since their cancel codes already specify out-migrants' destinations.

Places of origin should also be specified on the Alberta health care MRF. At present, this information is maintained on a separate file.

Elaboration of these codes should involve comparatively few problems. It would not be necessary to change registration forms or the format of the master files. Changing the relevant computer software to perform this task would entail no problems. In addition, advantages could be obtained by the health care commissions from the elaboration of destination codes, since it would make it easier to trace people who had left the province. This might be necessary to clarify an old medical bill, for example. If the province of destination and date of out-migration and/or of administrative action were known, it might be possible

to trace the person with the cooperation of health care authorities in the new province of residence.

(c) Level of Data Produced

The proposed methodology would group estimates of out-migration, in-migration and net migration for user-specified geographical areas in a single table. The level of detail and the approach to specifying geographical units would depend on (i) user interest or demand, (ii) available funds for programming and data analysis, and (iii) the number of migrants involved. Obviously, it would not be meaningful or feasible to obtain the same level of detail for a village as for a census division or metropolitan area.

The levels of detail shown throughout this section are merely *suggested* levels subject to alteration on the basis of the above criteria. Presumably, the methodology would initially be developed for census divisions, and would later be extended to other levels of aggregation.

The initially proposed units for generating migration data are as follows:

(i) Census divisions.
(ii) Metropolitan centres.
(iii) Other major centres (over 10,000 population).
(iv) Municipalities, towns and villages with 1,000-10,000 people.
(v) Any other geographical units specified by the user.

The final category might include specific smaller communities of particular interest, such as newly-developing resource towns. Economic or development regions might also be used as an alternate framework to the census divisions.

For the various scales of resolution, different levels of detail would be appropriate. The proposed elaboration is as follows:

(i) Census divisions and metropolitan centres (e.g., Edmonton): intra-provincial migration subdivided according to C.D.; inter-provincial according to province or territory; and international migration according to continental regions.
(ii) Other major centres (over 10,000): intra-provincial, inter-provincial and international, with no further elaboration.
(iii) Smaller places: total number of migrants (in-, out- and net), with no elaboration.

See Tables A1 and A2 for the structure proposed for these tables.

A second set of tables would provide an age/sex breakdown of the migrating population. For census divisions, metropolitan areas and other major centres, age/sex data would be given by 10 year cohorts. It would not be realistic to derive such a detailed breakdown for smaller places, due to the small number of migrants involved in most cases. For

these localities, a breakdown by sex and three age cohorts (0-14, 15-64 and 65+) could be produced.

(d) Geographical Breakdown

Both the family allowance and health care files contain postal codes for registrants. These codes may be utilized to derive user-specified geographical units. The postal code translation methodology necessary to create user-specified regions has already been developed.

To produce the results described in the previous section, a two-stage regionalization would be appropriate. In the first stage, postal codes would be classified according to census divisions. In the case of major urban centres such as Edmonton, "Edmonton" codes and "other, C.D. 11" codes would form separate categories which could readily be combined to give the total for the entire census division. In the second stage, a new classification would be used. Postal codes for all places with 1,000 people or more and other specified localities would be identified. Other postal codes would be assigned to a residual category. The same postal code translation criteria would be used for both the health care and family allowance files.

For inter-provincial and international migration, the program would examine the data fields where information on province of origin or destination was stored. However, the postal code would still be consulted to determine the place of destination for people arriving, and the place of origin for those leaving the province.

(e) Outline of the Methodology

The proposed method involves the utilization of Program F 59, to identify children moving from one census division to another. For our purposes, these will be classed as migrants, while persons changing addresses *within* a C.D. are considered to be non-migrants.

Multipliers derived for the health care file are used in a second step to derive estimates of total migration streams, i.e., of all cohorts rather than only children. For the spatial analysis of migration, multipliers are obtained by dividing total population for a C.D. or other unit of analysis by the population aged 0-17. For the age-sex analysis, the health care file would provide information on the age/sex composition of the migrant population.

Separate multipliers are calculated for in-migration streams and out-migration streams. Net migration is obtained from the difference between these two values.

Gross out-migration from, for example, C.D. 1 to C.D. 2 would be calculated by multiplying the number of family allowance transfers from C.D. 1 to C.D. 2 by the corresponding multiplier derived from

health care data on movements by registrants from C.D. 1 to C.D. 2.

(f) Rationale of the Methodology

It is assumed that the family allowance file gives the most accurate picture available from any current administrative file on the movement of a particular population group, i.e., children aged 0-17 years. The file lists virtually all children, and provides information on the address of their parent or guardian. Registrants have a positive incentive to report address changes, since the delivery of the monthly cheque is dependent on the provision of a valid address. Because mailings are made each month, persons who have moved but failed to report an address change are likely to be identified at an early stage. In short, family allowance data give virtually complete coverage of a particular cohort, and are relatively "clean" in terms of the accuracy of addresses listed. The file is also readily available for migration estimation purposes. Completion of the F 59 program will make the suggested methodology possible.

Provincial health care files vary greatly in terms of their accuracy. That of Saskatchewan, for example, appears to contain far fewer invalid entries than that of Alberta. This is largely due to the differing levels of importance assigned to the maintenance of an accurate master file, and the different levels of resources allocated for this purpose. This means that the raw numbers on migration derived from different health care files have varying levels of reliability. In the case of Manitoba and Alberta, apparent errors in the registered population are sufficiently large that counts of migrant numbers would not inspire any great level of confidence. It is well known that a large proportion of intra-provincial migrants do not voluntarily report address changes. In-migrants to a province may delay registering for some time after taking up residence in a new province, particularly if the user fees are significantly higher than those in his province of origin. Most migrants bound for Ontario and Quebec are simply "lost" because the health care commissions of these provinces do not cooperate in the exchange of information on inter-provincial migration. Where new registration forms are not re-issued annually, as in Manitoba in recent years, the number of unidentified migrants (i.e., incorrect mailing address) grows steadily. Their recent re-introduction of a residence verification scheme for inactive registrations has significantly reduced the problem.

While there is reason to be skeptical about the actual *numbers* of migrants according to health care files, especially in Alberta and also in Manitoba, there is no reason to suspect any significant age-sex bias in the non-reporting migrant population. In other words, the migrant *profile* (age-sex structure) can be assumed to have no systematic biases.

For this reason, multipliers based on the ratio of children to the total population or to other age-sex cohorts can be calculated and assumed to be comparatively accurate. These multipliers can be used to derive estimates of total migration flows, given family allowance data on the movement of children aged 0-17.

Several of the weaknesses of the current family allowance methodology for deriving inter-provincial migration estimates pertain to the multipliers. A single multiplier is calculated for each province of origin and applied to all provinces of destination. There is no allowance for seasonal variations in multipliers, nor for year to year change in inter-censal periods. The provincial out-migration multipliers are used for in-migration as well, thus implying that in-migration streams are a function of the provinces of origin (i.e., out-migration).

Use of health care data in the present study makes it possible to circumvent many of these problems and unreasonable assumptions. Multipliers can be constantly updated, thus reflecting seasonal and year to year shifts in the composition of migration streams. The health care multipliers are based on an analysis of actual migration streams between two specific regions or localities. Because these regions are based on aggregates of postal codes, the user is not constrained in his selection of spatial units. Thus, the problem of the representativeness of a single provincial multiplier within different parts of the province is overcome. Separate in-migration and out-migration multipliers are calculated, making it unnecessary to make contentious assumptions about the region of origin being more important than the region of destination in determining the composition of migration streams. The health care files also permit the derivation of age/sex profiles of the various migration streams under consideration.

(g) Tables

Examples are given on the following pages to show the proposed format for tables to be generated with the program. Tables A. 1 to A. 4 would give final estimates of migration volume (based on family allowance transfers x multipliers), and are therefore the most important of the tables. They show:

Tables A. 1 and A. 2 - Migration, by places of origin and destination.

Tables A. 3 and A. 4 - Age/sex composition of the migrating population.

In addition to these four tables which show the data of primary interest, parallel tables should be produced to show the components (intermediate data) used to calculate the estimates in the A series of tables. The secondary tables can be produced with little cost or difficul-

ty, and provide means of readily identifying errors and anomalous results, and of rectifying these problems.

TABLE A. 1

MIGRATION, BY PLACES OF ORIGIN AND DESTINATION
(FAMILY ALLOWANCE X MULTIPLIERS)

Date:
Census Division

	In-Migration	Out-Migration	Net Migration	Net (Previous) 6 mo.)	Total (Year)
Intra-provincial					
C.D. 1	N	N	N	N	N
	(%)	(%)	(%)	(%)	(%)
C.D. 2	.	.	.	.	.
	.	.	.	.	.
	.	.	.	.	.
.					
.					
.					
C.D. 15					
Sub-total					
Inter-provincial					
Newfoundland	N	...			
	(%)				
P.E.I.	.				
	.				
.	.				
.					
.					
Territories					
Sub-total					
International					
U.S.A.	N				
Other Americas		...			
.	.				
.					
.					
Sub-total					
Total	N				
	(100%)				

TABLE A. 2

MIGRATION, BY PLACES OF ORIGIN AND DESTINATION
(FAMILY ALLOWANCE X MULTIPLIERS)

Date

	In-Migration	Out-Migration	Net Migration	Net (Previous 6 mo.)	Total (Year)
Cities over 10,000					
City A					
Intra-provincial	N (%)	N (%)	N (%)	N (%)	N (%)
Inter-provincial	.	.	.	.	.
	.	.	.	.	.
	.	.	.	.	.
International					
Total	N (100%)	...			
City B					
.					
.					
.					
Cities Total					
Towns 1,000-10,000					
Town A	N (%)	...			
Town B					
.					
.					
.					
Towns Total					
Residual					

TABLE A. 3

AGE/SEX COMPOSITION OF THE MIGRANT POPULATION
(FAMILY ALLOWANCE X MULTIPLIERS)

Date

	Male								Female								Grand
	0-4	5-14	15-24	25-34	35-44	45-64	65+	Total	0-4	5-14	15-24	25-34	35-44	45-64	65+	Total	Total
In-Migration																	
C.D. 1	N	...															
	(%)																
C.D. 2																	
.																	
.																	
.																	
C.D. 15																	
Total																	
City A																	
City B																	
.																	
.																	
.																	
Out-Migration																	
C.D. 1																	
.																	
.																	
.																	
City A																	
.																	
.																	
.																	
Net Migration																	
C.D. 1																	

TABLE A. 4

AGE/SEX COMPOSITION OF MIGRANT POPULATION FOR PLACES UNDER 10,000 PEOPLE (FAMILY ALLOWANCE X MULTIPLIERS)

	Male			Female			
	0-14	15-64	65+	0-14	15-64	65+	Total
In-Migration							
Town A	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Town B							
.							
.							
.							
Town ...							
Total							
Out-Migration							
Town A							
Town B							
.							
.							
.							
Town ...							
Total							
Net Migration							
Town A							
Town B							
.							
.							
.							
Town ...							

The following tables of intermediate data are suggested:

Table B. 1 —Migration multipliers from health care data for places of origin and destination (census divisions and metropolitan centres).

Table B. 2 —Migration multipliers from health care data for places of origin and destination (designated municipalities).

Table C. 1 —Children 0-17 identified as migrants through family allowance files: places of origin and destination (census divisions and metropolitan centres).

Table C. 2 —Children 0-17 identified as migrants through family allowance files: places of origin and destination (cities over 10,000; places 1,000-10,000).

Table D. 1 —Migration estimates from health care files: places of origin and destination (census divisions and metropolitan centres).

Table D. 2 —Migration estimates from health care files: places of origin and destination (cities over 10,000; places 1,000-10,000).

Table D. 3 —Migration estimates from health care files: age/sex distribution.

The C and D series of Tables should be virtually identical in format to the illustrated Tables A. 1 to A. 4. Maintaining a constant format would facilitate comparison of the various data series.

The one part of the Tables A. 1, B. 1, C. 1 and D. 1 which will show some variation is the international migration section. This is because the health care and family allowance files show different details about international migration.

The F 59 family allowance program will subdivide international immigration/emigration into

(i) Canadians, family allowance resumed/ceased
(ii) Canadians, family allowance continued
(iii) "Visitors"
(iv) Landed immigrants.

The AHCIP in-migrant file classifies international migrants by place of origin, as well as census division of destination. A slight adjustment of this classification is suggested:

(i) U.S.A.
(ii) Other Americas
(iii) United Kingdom
(iv) Other Europe
(v) Asia
(vi) Other.

With an additional step in the calculation of multipliers for international migrants, international migration estimates in Table A. 1 may be subdivided by places of origin/destination, even though family allowance data provide no geographical breakdown for international migrants. The necessary procedure is described briefly in the next section on multipliers.

The D series of migration estimates from health care files should also include an additional table with basic data on family status, i.e., classifying migrants as (i) single male, (ii) single female, and (iii) family registrations (number of families; total number of people in families).

In all of the tables shown, net migration would be calculated by subtraction (in-migrants minus out-migrants), rather than independently using multipliers and family allowance data.

TABLE B. 1

MULTIPLIERS CALCULATED FROM HEALTH CARE DATA: MIGRATION, BY PLACES OF ORIGIN AND DESTINATION (CENSUS DIVISIONS)

Date:

Census Division	In-migration multipliers			Out-migration multipliers		
	N total	N 0-17	Ratio	N total	N 0-17	Ratio
Intra-provincial						
C.D. 1						
C.D. 2						
.						
.						
.						
C.D. 15						
Sub-total						
Inter-provincial						
Newfoundland						
P.E.I.						
.						
.						
.						
Territories						
Sub-total						
International						
U.S.A.						
Other Americas						
.						
.						
.						
Other						
Sub-Total						
Total						

TABLE B. 2

MULTIPLIERS CALCULATED FROM HEALTH CARE DATA: MIGRATION BY PLACES OF ORIGIN AND DESTINATION (LOCALITIES)

Date:

	In-migration multipliers			Out-migration multipliers		
	N total	N 0-17	Ratio	N total	N 0-17	Ratio
City A						
Intra-provincial						
Inter-provincial						
International						
Total						
City B						
Intra-provincial						
Inter-provincial						
International						
Total						
.						
.						
.						
Town A						
Town B						
.						
.						
.						

(h) Multipliers

The concept of using multipliers or adjustment factors to account for partial coverage of the total population in an administrative file is well established. From the onset of work on deriving migration estimates from the family allowance file, such multipliers have formed an integral part of the methodology.

The multipliers previously used have been general ones, the use of which involved making significant, often contentious, assumptions about the uniformity of migration patterns. In the present methodology, multipliers are employed which, as far as possible, correspond in space and time to the actual migration streams being studied. Therefore, multipliers for Newfoundland-Edmonton migration are derived from health care data on the migration stream and counterstream linking these places. With smaller places for which it is not feasible to calculate specific multipliers, because of the smallness of the migration stream, multipliers for the relevant census division may be used. The one exception to this rule would be smaller centres recognized to be atypical, for which specific multipliers would be calculated.

For example, migration to new resource-development towns would probably differ from the general census division pattern, and therefore require individual multipliers.

The multipliers for determining the number of people moving in a particular migration stream are calculated from health care data as follows:

$$\frac{\text{Total number of migrants in the stream}}{\text{Migrants aged 0-17 in the stream.}}$$

Multipliers for international migration would require an additional step, due to the absence of any geographical breakdown for international migration in the family allowance file. After calculating multipliers for each international region from health care data in the usual way, each multiplier would be weighted by the proportion of total international migrants found within the particular stream. For example, if the health care file were to show that one-fifth of immigrants were from U.S.A., the weighted multiplier would be:

$$\frac{\text{Total number of U.S. immigrants}}{\text{U.S. immigrants aged 0-17}} \times 0.20$$

Each weighted multiplier would be applied to the relevant international immigrant (or emigrant) values from the family allowance file.

It would not be necessary to calculate multipliers *per se* for the age/sex breakdown of the population. Rather, the percentage of the migration stream contributed by each age/sex cohort would be calculated for each stream as defined in Tables A. 3 and A. 4, using health care data. The total numbers of in-migrants to a particular region would be divided according to the in-migrants age-sex percentages to provide numerical estimates by age and sex. A similar procedure would be used to derive out-migrant age/sex estimates, while net migration values may be calculated by subtracting paired in-migration and out-migration figures.

(i) Frequency of Calculation

The F 59 family allowance data are scheduled for production twice annually. This limits the present possibilities to a semi-annual or annual time frame.

It is hoped that eventually separate calculations, complete with new multipliers, can be made each quarter. This would permit the identification of seasonal variations in the size and composition of the migrant population, provide up-to-date data needed for short-term planning of purposes, and provide data which could be matched to other government files (e.g., immigration, and labour force statistics) which are issued quarterly.

(j) Verification

Data suitable for testing the proposed methodology are not readily available at present. Sub-provincial family allowance transfers will not be available until completion of the F 59 computer program. In the case of both Alberta and Saskatchewan, minor systems changes to the health care master files are needed. Although these adjustments have been made in the case of Manitoba, the changes and efforts to purge the files of invalid registrations have occurred too recently for sufficient "clean" data to be available for a test of the methodology.

The following chapter provides support for a more comprehensive system of multipliers, namely one which corresponds as closely in time, space and direction to the actual migration stream being calibrated. Selected Alberta health care data on in-migrants to the province are used for this purpose.

As a census year, 1981 constitutes an ideal base-line date for evaluating the methodology. Census population data provide a basis for assessing the reliability of health care registration data with greater confidence. As a first step in implementing the methodology, program development could be restricted to census division data. These data could be evaluated through comparison with other sources of census division demographic data, prior to a full implementation of the suggested methodology incorporating any necessary amendments.

5. A CASE FOR A MORE COMPREHENSIVE SYSTEM OF MULTIPLIERS FOR MIGRATION ESTIMATION FROM FAMILY ALLOWANCE DATA

At present, inter-provincial migration is calculated from family allowance account transfers using a single multiplier for each province of origin. Among the important assumptions necessary to use such a system are:

(a) The composition of migration streams is wholly "determined" by the area of origin, with the area of destination being insignificant. It is assumed that all migration streams originating in one province are identical in composition.
(b) The composition of migration streams does not change significantly over time, either during the year, or during the five year inter-censal period.

If intra-provincial migration is to be monitored, it is obvious that a more comprehensive system of multipliers would be preferred, if not required. The only alternative would be to assume that the present provincial multipliers apply equally to all destinations within a province, and that intra-provincial migration be estimated using the (inter-provincial) multiplier for that province.

Alberta health care data pertaining to new registrants originating outside the province are available for the period 1977-80, and can serve as a basis for examining questions about spatial and temporal variation in migration streams. Although this source contains some data on the ages of in-migrants, it is less comprehensive than one would prefer. For example, there are no data on age by place of origin. It is possible, however, to use the percentage of migrants who were single, i.e., having no dependants, as rough surrogate for the ratio of total migrants/0-17 years old migrants. Presumably, the higher the proportion of single migrants, the lower the proportion of children 0-17 in the migration stream. This is supported by monthly migration data which show the proportion of 0-14 year olds at its highest point and of singles at its lowest point during the summer months.

In the present case study, multipliers have been calculated for 6 month periods, since this is the current time frame for production of family allowance statistics. Use of the 6 month time frame inevitably

suppresses much of the month to month and quarter to quarter variability in migration flows. Quarterly estimates would be best, much more accurately reflecting the actual pattern of variability in the size and composition of migration streams.

Table 5.1 shows the ratio of total in-migrants to 0-14 year old migrants for Alberta census divisions. This ratio approximates the multiplier suggested in the previous chapter, and corresponds closely to those used presently for inter-provincial migration estimates from family allowance data.

There is tremendous variability in the size of these ratios according to the destination of inter-provincial migrants. Ratios vary from 2.58 in C.D. 4 to 13.33 in C.D. 9. The latter C.D. is particularly atypical, since it includes the mountain national parks which attract many short-term, single, young adult workers. Census divisions 6 (Calgary) and 11 (Edmonton) have a significantly lower proportion of children among their migrants than do other divisions (with the exception of C.D. 9).

Clearly, the use of a single multiplier for all census divisions of destination would introduce an unacceptably large source of error into the resulting estimates. Comparison of the January-June to July-December ratios in Table 5.1 shows some seasonal variation in the size

TABLE 5.1

RATIO OF TOTAL IN-MIGRANTS TO IN-MIGRANTS 0-14
FOR ALBERTA CENSUS DIVISIONS

Census Division	July — December, 1979			January — June, 1980		
	Total	0-14	Ratio	Total	0-14	Ratio
1	1,725	461	3.74	1,181	294	4.02
2	2,021	457	4.42	1,855	437	4.24
3	382	128	2.98	255	75	3.40
4	115	32	3.59	103	40	2.58
5	523	141	3.71	407	124	3.28
6	31,363	6,069	5.17	24,828	4,674	5.31
7	398	115	3.46	318	80	3.98
8	2,946	692	4.26	2,628	667	3.94
9	1,156	87	11.29	1,080	81	13.33
10	1,408	381	3.70	1,064	270	3.94
11	25,168	4,870	5.17	23,524	4,440	5.30
12	2,838	787	3.61	2,502	740	3.55
13	525	166	3.16	369	102	3.62
14	1,205	335	3.60	1,080	245	4.41
15	3,764	868	3.79	3,602	844	4.27

Source: Alberta Health Care Migration Data, January 1981.

ALBERTA

CENSUS DIVISIONS

ESTIMATED POPULATION
(1979)

Source : A.B.S.

of multipliers. In 7 of the 15 C.D.s the two values differ by more than 10%. The January-June values seemed to be higher in the majority of cases (10 of 15 C.D.s). As previously mentioned, the case for seasonal adjustment of multipliers would be even stronger if quarterly values were substituted for semi-annual ones.

Table 5.2 provides further elaboration of seasonal variability in migrant characteristics by showing the percentage of single registrants among migrants by province of origin for four years. It is apparent that the composition of migrant streams varies not only from one season to another, but from year to year. The record presented is too brief to reach any solid conclusions. It appears that the migrant characteristics *fluctuate* over time, rather than displaying any steady trend (e.g.,

TABLE 5.2

IN-MIGRATION TO ALBERTA 1977-80 FROM SELECTED PROVINCES: PERCENTAGE SINGLE AND TOTAL NUMBER OF MIGRANTS

Province	Year	January - June No. Migrants	January - June % Single	July - December No. Migrants	July - December % Single
Newfoundland	1977	635	37.5	1,259	45.8
	1978	1,356	33.9	1,383	42.6
	1979	1,257	45.8	2,124	41.5
	1980	1,734	44.3	1,649*	38.7
Ontario	1977	7,631	47.5	15,137	42.4
	1978	14,072	42.3	18,019	39.4
	1979	22,462	34.2	25,188	42.0
	1980	26,876	43,8	21,832*	37.7
Manitoba	1977	1,800	37.8	4,336	33.8
	1978	4,303	35.0	5,947	33.3
	1979	5,066	35.9	7,361	34.1
	1980	4,953	39.8	5,209*	30.1
Saskatchewan	1977	2,176	44.9	5,638	41.0
	1978	4,715	41.2	6,768	38.0
	1979	4,691	44.0	6,826	40.1
	1980	4,310	50.0	5,028*	36.5
British Columbia	1977	6,394	41.7	11,031	39.6
	1978	10,920	38.0	12,926	37.9
	1979	10,632	41.3	12,014	42.5
	1980	9,863	44.0	7,905*	38.5
Foreign	1977	2,297*	33.1	6,942	32.0
	1978	5,608	29.9	6,061	36.1
	1979	4,463	32.3	9,953	28.4
	1980	9,226	27.8	11,161	27.7

* Incomplete registration
Source: Alberta Health Care Migration Data, January 1981.

TABLE 5.3

IN-MIGRATION TO ALBERTA 1976-80: PERCENTAGE SINGLE AND TOTAL NUMBER OF MIGRANTS ( )
FROM SELECTED PROVINCES, BY CENSUS DIVISION

Census Division	Newfoundland	Ontario	Manitoba	Saskatchewan	British Columbia	Canadian In-migrants	Foreign Immigrants
1	40.4 (104)	31.2 (1,625)	26.8 (904)	36.2 (904)	33.3 (1,227)	33.7 (7,175)	36.4 (1,292)
2	26.4 (121)	33.3 (3.243)	23.0 (1,423)	33.3 (1,965)	35.1 (2,464)	32.9 (10,358)	28.4 (1,815)
3	87.1 (14)	32.6 (448)	21.8 (216)	30.7 (300)	30.6 (620)	29.9 (1,842)	25.1 (367)
4	—— (15)	37.0 (127)	17.6 (51)	26.3 (293)	33.6 (146)	27.5 (734)	27.4 (62)
5	83.3 (12)	32.4 (716)	29.8 (325)	28.8 (490)	28.2 (652)	29.8 (2,580)	35.0 (506)
6	50.8 (2,726)	42.9 (65,270)	37.1 (16,442)	37.1 (12,743)	44.6 (29,733)	43.8 (158,616)	29.0 (22,751)
7	52.4 (21)	29.4 (521)	21.7 (313)	21.1 (660)	25.9 (553)	26.0 (2,309)	27.2 (257)
8	34.3 (306)	36.2 (5,003)	30.5 (1,612)	34.8 (2,489)	31.5 (4,245)	34.2 (16,018)	30.8 (1,599)
9	51.3 (39)	85.6 (3,849)	60.7 (366)	49.0 (410)	48.6 (1,501)	74.5 (7,645)	57.0 (379)
10	31.2 (122)	30.6 (1,224)	22.6 (576)	25.8 (2,623)	31.1 (1,339)	28.2 (6,612)	28.5 (807)
11	53.6 (3,241)	42.6 (50,476)	37.5 (12,603)	45.6 (11,762)	45.3 (27,091)	43.6 (130,061)	32.7 (21,173)
12	32.2 (2,853)	29.9 (5,372)	30.3 (1,379)	32.5 (1,256)	28.8 (2,844)	30.8 (17,302)	34.4 (1,790)
13	66.7 (12)	34.9 (559)	25.4 (283)	30.7 (283)	26.4 (846)	30.0 (2,382)	31.0 (313)
14	29.5 (210)	33.8 (2,016)	23.5 (778)	33.1 (873)	25.1 (2,160)	29.6 (7,365)	38.2 (380)
15	28.1 (505)	37.9 (4,717)	27.8 (1,448)	35.8 (1,733)	32.1 (6,023)	33.9 (17,979)	21.5 (1,508)

Source: Alberta Health Migration Data, January 1981.

toward a higher percentage of single migrants). However, the variability is sufficiently great to lend strong support to the case for frequently updating the multipliers.

Table 5.2 confirms the premise behind the system of multipliers currently used by Statscan; namely, that the compositions of provincial out-migration streams differ significantly from each other. The percentage of single registrants is generally in the low 30s for Manitoba compared to the low 40s for Newfoundland, for example.

Table 5.3 shows that the composition of migration streams differ not only by place of origin but by place of destination. This table represents an elaboration of Table 5.1. Using Ontario as an example, single migrants from this province constitute under 30% of the total Ontario stream to two census divisions, compared to 43% for Calgary and Edmonton and 86% for C.D. 9 (Jasper-Banff). Comparing various places of origin for each destination, there is a rough correspondence in terms of which percentages tend to be highest (i.e., chiefly C.D.s 6, 9 and 11) and lowest (e.g., C.D.s 4 and 10). However, there is sufficiently great variability that these are best considered tendencies rather than clear patterns.

The implication of this short case study is clear. Multipliers should be as specific as possible in place, time and direction to the actual migration stream being considered. Direction refers to the need to separately compute in-migration and out-migration ratios.

One pitfall has to be avoided. As the definition of migration streams becomes more specific in time, space and direction, the numbers of migrants involved decreases. This may lead to meaningless results. This problem is illustrated in the case of Newfoundland for C.D.s 3, 4, 5 and 13. Use of a less specific multiplier referring to a more general space (in the above example, Newfoundland migration to Alberta), or time (e.g., a longer time span) should be substituted in such a case. At this stage, it is premature to suggest ground rules for dealing with such cases. These rules are better elaborated through a trial and error process at the time of program development and testing.

6. SUMMARY AND RECOMMENDATIONS

Changing economic conditions in the Prairie provinces are bringing about changes in the volume and direction of migration. Long an area of net out-migration, the Prairie provinces, with the exception of Manitoba, are now gaining population at the expense of other provinces. Certain economic boom regions attract the bulk of migrants, while agricultural areas and regions of economic stagnation within the Prairies continue to suffer a net loss of population due to migration. Migration has several significant demographic and economic consequences both in areas of net gain and net loss. Demand for services and the feasibility of providing such services are profoundly affected. Consequently, governments are very interested in obtaining data on migration as an input into their planning processes.

Migration estimates may be obtained in various ways. The residual method derives estimates of migration by subtracting natural increase from total population increase for a given locality and time span. This method is dependent on the accuracy of the total population figures, and is retrospective. Various types of projections and econometric models are used to forecast migration from a knowledge of past migration trends or the relationship between various determinants of migration and population mobility. These forecasting models vary greatly in their conceptual validity and tracking ability. However accurate they are, they still represent only estimations of expected migration levels rather than studies of actual migration behaviour. Migration estimates may also be obtained through some form of monitoring of actual population movement. The ideal basis for such monitoring is the migration register which is used in a number of countries. In Canada, however, it is necessary to use some other format, such as the sample survey or address changes in administrative files to estimate the numbers of people migrating.

Approximately a dozen administrative files were investigated as possible sources of migration data. To be useful for this purpose, a file should have the following characteristics:

(i) Be fully computerized.
(ii) Be accessible to agencies interested in migration.
(iii) Contain locational information available for all registrants in a machine processable format.
(iv) Report any address changes promptly and completely.

(v) Show an absence of serious systematic biases (such as by age, sex, income or location) in coverage.
(vi) Contain complete coverage of the total population, or at least of a specific age cohort or have a high and known level of coverage.

On the basis of these criteria, the health care files for the three provinces and the federal income tax and family allowance files emerge as the most promising sources of data. At the present time, other data sources may be eliminated, except to provide specific supplementary data. For example, Immigration 1,000 remains important for immigration estimates, and drivers' license transfers could be used to estimate out-migration to Ontario and Quebec as long as these provinces continue to opt out of the exchange of information on inter-provincial health care registration transfers.

The Saskatchewan health care file represents the single most attractive file for monitoring migration. The province expends considerable effort and money in order to minimize errors in the file. As a result, the discrepancy between its registration figures and the Statscan estimates for Saskatchewan's population is under 2%, and it is likely that the great majority of address changes due to population mobility are recorded on the Master File within a year (and usually much less), due to the voluntary reporting of moves, the annual mail-out of registration forms, and other monitoring procedures. The potential value of using the file for demographic statistical analysis seems to be widely recognized within the Saskatchewan government. It is probable that reasonable estimates of migration affecting Saskatchewan can be obtained from the Saskatchewan health care file without system changes or file "clean up" being necessary.

The Alberta health care file is unlikely to yield accurate migration data directly in its present condition. The 1980 AHCIP registered population differs from the ABS estimate of the province's population by more than 6%. An improved coding procedure on the MRF with respect to both in-migrants and out-migrants is also needed. AHCIP, in cooperation with ABS, is considering ways to improve the file, subject to inevitable programming, confidentiality and cost constraints.

Manitoba's health care MRDB is currently in a transitional stage. Registration information had become increasingly inaccurate due to reduced file editing and verification procedures. However, efforts are now being made to clean up the file, improve file maintenance procedures, and increase its utility as a demographic data base. It is too early to assess the effectiveness of these efforts.

The family allowance file has some significant advantages, but also has important disadvantages. Coverage is essentially complete for the 0-17 age cohort, and there are effective incentives for parents to

promptly report address changes. However, it is necessary to derive some means of converting the child migration figures into estimates of total migration flows, generally by using multipliers. This inevitably introduces significant errors, due to assumptions about the stability of migration streams with regard to time, space and direction. It is believed that health care data could be used to minimize these errors.

Income tax data at first appear to have real potential as a source of migration data. There is approximately 90% coverage of the population, and an automatic annual reporting of current address with the filing of tax returns. Socio-economic data are available in greater detail from tax records than from any other major file. The comparatively long time span between the occurrence of some moves and their actual reporting on a tax form is an important short-coming of the data. Likewise, the necessary assumption that the 10% non-filing population does not significantly differ from the general population in migration behaviour is somewhat contentious. An analysis of preliminary data on Alberta migration extracted from the income tax files suggests that there are still significant problems to be overcome before reliable migration estimates can be derived from this source. For whatever reason, there were large discrepancies between income tax estimates of migration and Statscan residual estimates for 1971-76 for most Alberta census divisions. Moreover, the great variations in the magnitude and even the direction of apparent errors makes it unlikely that correction factors could be applied to overcome these difficulties.

The third section of the report summarizes methodologies currently in use and under development for the estimation of international, inter-provincial and intra-provincial migration. At present, there is no single system which provides meaningful data on all these types of mobility for both in-migration to a geographical region, and out-migration from it. However, several projects are in progress which are attempting to derive methodologies covering the full range of mobility types. Of these, the income tax filers' migration series, the sub-provincial family allowance mobility program known as F 59 and the Saskatchewan sub-provincial migration program based on health care registration data have the greatest potential.

The development of methodologies to estimate migration has been retarded until recently by the incomplete computerization of files and the absence of a workable geocoding system. The widespread use of postal codes and the development of postal code translation methodologies have now rectified the latter problem.

Most work to date has been with the family allowance account transfer data at the inter-provincial scale. Provincial-level multipliers calculated from census data are applied uniformly to all migration streams from each province to estimate total migration from child (i.e.,

family allowance recipient) migration. Although the assumption of a uniform composition of migration streams over time, space and direction of movement is at best very contentious, the procedure has generated the best data currently available on inter-provincial migration.

An analysis of health care data on in-migration to Alberta since 1976 has shown the above "uniform migration" assumption to be unrealistic. Significant variations were found in the age/sex composition of migration streams according to the province of origin, the census division of destination, and the season of the year, as well as considerable fluctuations from year to year. This analysis highlighted the need for a much more flexible system of multipliers which would correspond as specifically as possible to the actual migration stream in question — temporally, spatially and directionally.

A methodology has been proposed as a means of obtaining improved, comprehensive estimates of all categories of migration for user-defined sub-provincial units. The procedure would involve use of both the family allowance transfer data to be generated by the still-incomplete Program F 59 with migration stream-specific multipliers derived from health care files.

In simplified form, the method involves the following steps:

(i) Specification by the user of areal units, based on aggregates of postal codes.
(ii) Calculation of the number of child migrants moving between each zone and other zones (intra-provincially, inter-provincially and internationally).
(iii) Calculation from contemporary health care data for each migration stream of a multiplier, i.e.:

$$\frac{\text{total migration population in stream}}{\text{migrants 0-17 in stream.}}$$

Separate in-migration and out-migration multipliers are calculated.
(iv) Estimation of the total number of people in a particular migration stream from the product (family allowance transfers x matching multiplier).
(v) Calculation from health care data of an age/sex breakdown of migrants.

The computer may be programmed to routinely generate all the necessary data at 6-month intervals, to correspond with the expected periodicity of F 59 output. Provisos for missing or insufficient data situations can easily be incorporated into the program.

In order to operationalize this procedure, a single systems adjustment would be needed to the health care files of Alberta and Saskatchewan. A simple elaboration of the present "left the province" code for persons reported as migrating away from the province would be necessary in order to show the province or international region of destina-

tion. This elaboration should not entail significant difficulties for the provincial health care commissions.

The major advantage of the proposed system lies in its applicability to the health care files in their present condition. Major improvements in the accuracy of the file or level of recording of migration would not be essential. It is necessary to assume only that there are no systematic age/sex disparities between the portion of the migrant population which reports address changes relatively promptly, and those who do not. In other words, if the age/sex *profiles* of the migrant populations recorded in the health care files do not differ significantly from the profiles of the total (recorded plus unrecorded) migrant populations, accurate multipliers may be obtained irrespective of whether some migration episodes are unrecorded in the health care master files.

The proposed methodology utilizes the strengths of the two data sources, while minimizing their weaknesses. The family allowance file is much more prompt and complete than the health care files in the recording of migration. By depending on family allowance data to provide an accurate picture of the migration behaviour of the 0-17 cohort, the method circumvents the problem of any under-recording of migration in health care data. Health care records provide a basis for viewing the total migrating population, unlike the family allowance accounts which cover only 0-17 year old children.

The method of deriving multipliers represents a significant improvement on current family allowance multiplier calculation. Unrealistic assumptions about the uniformity of migration streams in relation to time, space and the direction of movement, which characterize the present methodology, are eliminated. Specific multipliers are calculated for each specific migration stream whenever the number of migrants permits it. If spatially or temporally aggregated multipliers have to be used, such as for very small communities, the principle of using the most relevant aggregate multipliers (e.g., for the census division in which the community is located) is always applied.

A final advantage of the methodology is the fact that it is politically feasible. Major systems changes and significantly improved file maintenance are not needed. If some improvement in the quality of health care data could be achieved in Manitoba and Alberta, it is probable that very useful and sufficiently accurate migration data could be obtained directly from the health care files.

Saskatchewan's health care file appears to be sufficiently accurate to merit special attention. The Saskatchewan Bureau of Statistics is currently attempting to develop a program to compute sub-provincial migration estimates from their health care master file. There is reason for optimism concerning this attempt. Certainly, if accurate migration data cannot be obtained from the Saskatchewan file, given the exten-

sive and expensive maintenance procedures used, attempts to use simple monitoring procedures to calculate migration from health care files in other provinces would be unlikely to succeed.

If the Saskatchewan experiment succeeds, it would provide the strongest possible argument for Alberta and Manitoba to upgrade their health care files so that similar programs could be applied. Ultimately, this is a political decision focusing on whether individual and health care system confidentiality of data is threatened by developing the files as a demographic data base, and whether the benefits in the form of better migration estimates justify the additional administrative costs needed to maintain a "clean" file. It is important, however, that agencies interested in demographic data continue to press for improvements in the quality of health care file maintenance, and continue to argue the case for developing this source as a demographic data base. A particularly strong argument for developing provincial self-sufficiency is provided by the vulnerability of the provinces as long as they depend on federally-controlled data. Any move to restrict the availability of family allowance data or to restrict eligibility for family allowance to families with less than a given income could profoundly limit the availability of current migration estimates. Upgrading the health care files would at least ensure that an acceptable alternative to family allowance data would be readily available.

A final recommendation concerns the potential utility of developing migration drop files to facilitate the analysis of migration data. This procedure would involve routinely copying basic information such as old and new addresses, dates of migration and administrative action, socio-demographic characteristics and registration status onto a collector file whenever an individual record on a master file was accessed for amendment. These drop or collector files could then be analyzed to provide migration data. Such a system would be far less complex, and more efficient in terms of computer time than the present system whereby individual registration numbers have to be matched on successive versions of an administrative file.

Work on monitoring migration from administrative files is still in its infancy. Significant advances in methodology can be expected in the relatively near future, given the growth of interest in the field, and the improvement in analytical capability.

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